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The Marine Fisheries Information Service : Technical and Extension Series envisages dissemination of information on marine fishery resources based on research results to the planners, industry and fish farmers, and transfer of technology from laboratory to field.

Farming of the seaweed *Kappaphycus alvarezii* in Tamil Nadu coast - status and constraints

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Kappaphycus alvarezii is one of the economically important red algae, which yields carageenan, a commercially important polysaccharide. Carrageenans are used in a variety of commercial applications as gelling, thickening, and stabilizing agents, especially in food products such as frozen desserts, chocolate milk, cottage cheese, whipped cream, instant products, jellies, pet foods and sauces. Besides, carrageenans are used in pharmaceutical formulations, cosmetics and industrial applications such as mining. Commercial cultivation of *K. alvarezii* originated in Philippines in the year 1960. Since then, countries like Japan, Indonesia, Tanzania, Fiji, Kiripati, Hawaii and South Africa have been cultivating this species on a large scale. In India, cultivation of this seaweed started at Mandapam on the south-east coast of India, during 1995–1997. Initially, net-bag technique was practiced. Later, based on the results of more than 120 trials, the bamboo raft technique emerged as the most suitable commercially viable method. The contract farming method with PepsiCo was successfully implemented in March 2003. Later in the year 2008, Aquagri took over the PepsiCo project. Experience obtained from experimental and field cultivation of *K. alvarezii* in several Indian coastal areas indicate the possibility of large-scale commercial cultivation and a means of additional income generation for the coastal fisherfolk. Commercial cultivation of *K. alvarezii* started in 2003 along the Tamil Nadu coast. At present, *K. alvarezii* production is carried out in five coastal districts of Tamil Nadu namely Ramanathapuram, Pudukottai, Thoothukudi, Thanjavur and Kanyakumari.

Culture techniques

Along Tamil Nadu coast, floating raft method (Fig. 1) was found to be commercially viable method in *K. alvarezii* farming. Floating raft is made of bamboo with 12' × 12' for mainframe and 4' x 4' for

Fig. 1. Floating raft method in *K. alvarezii* farming

diagonals. In each raft, 20 polypropylene-twisted ropes are used for plantation. The fragments (approximately 150 g) are tied at a spacing of 15 cm in a rope (Fig. 2). Totally, at 20 points the fragments are tied in a rope. Thus, for one raft the plantation requirement is 60 kg. To protect the *Kappaphycus* from grazing, fishing net of 4 m x 4 m size is tied at the bottom of the raft. One anchor of 15 kg can hold a cluster of 10 rafts. During rough season two to three anchors are required to hold a cluster of 10 rafts.

Fig. 2. Seaweed fragments being tied in the rope

The unit cost per bamboo raft for *K. alvarezii* farming works out to be ‘ 1000. Details are given in Table 1.

Table 1. Unit cost per bamboo raft for seaweed cultivation

Item	Quantity required	Cost per raft (₹)
3-4" dia hollow bamboos of 12’x 12’ for main frame + 4’ x 4’ for diagonals (without any natural holes and cracks) @ ₹ 3.75 per feet of bamboo	64’	240.00
Five-toothed iron anchor of 15 kg each (@ ₹ 50 per kg) – one anchor can hold a cluster of 10 rafts	1.5 kg	75.00
3 mm PP twisted rope for plantation – 20 bits of 4.5 m each (@ ₹ 130 per kg)	420 g	55.00
Cost of HDPE braider pieces (20 pcs x 20 ropes = 400 pcs of 25 cm each) (@ ₹ 190 per kg)	165 g	31.00
Braider twining charges @ ₹ 1.00 per 20 ties. For one raft 400 ties = ₹ 20	20 ropes	20.00
Raft framing rope 6 m x 12 ties per raft *i.e*., 36 m of 6 mm rope (@ ₹ 130 per kg)	650 g	85.00
Used HDPE fishing net to protect the raft bottom (4 m x 4 m size) (@ 60 ₹/kg) + labour charges ₹ 10	1 kg	70.00
2 mm rope to tie the HDPE net (28 m) (@ ₹ 130 per kg)	100 g	13.00
Anchoring rope of 10 mm thickness (17 m per cluster of 10 rafts) (@ ₹ 130 per kg)	100 g	13.00
Raft linking ropes per cluster 10 rafts – 6 mm thick – 2 ties x 3 m x 9 pairs = 54 m length (@ ₹ 130 per kg)	100 g	13.00
Seed material (150 g x 400 ties @ ₹ 2.50 per Kg)	60 kg	150.00
Raft laying + maintenance cost	-	100.00
Miscellaneous expenses	-	135.00
Total cost per raft		1,000.00

Self Help Group model in *K. alvarezii* cultivation in Tamil Nadu coast

In *K. alvarezii* cultivation, self help group model promoted by District Rural Development Agency (DRDA), Department of Biotechnology (DBT) and Tamil Nadu State Fisheries Department with the assistance of Non-Governmental Organizations (NGOs) is found to be more effective (Fig. 3). A group of five members including men and women is formed, which is called as Joint Liability Group (JLG). Some of the eligibility conditions, which a group has to fulfill are:

Fig. 3. Planting of 150 g grows up to 500 to 1000 g in 45 days

- Each member in the group has to undergo three days training programme on seaweed cultivation.
- Should be Below Poverty Line.
- Preferably, they should have place near the sea shore.
- Should not be a defaulter with any financial institution / government.
- Interest and willingness of the farmer to take up *K. alvarezii* farming.

The group that fulfills the above conditions is eligible to avail ₹1.54 lakhs as loan for 225 rafts (45 rafts per member). Out of this ₹1.54 lakhs, ₹ 77,000 is given as subsidy through the concerned promoting agency. Remaining ₹ 77,000 is availed by the members through bank loan at nominal interest, which has to be repaid within three years.

Economic impact due to adoption of *K. alvarezii* farming

The farming is taken up for nine months (*i.e.*, February to October) in a year. The crop is ready for harvest after 45 days from planting (Fig. 4). From the 45th day, one raft is harvested every day (Fig. 5) and subsequently planted and floated in the sea. Hence, one crop / cycle duration is 45 days. In the first year, four crops are harvested. During the second and third year, three crops are harvested. On an average three to four crops are harvested in an year.

Fig. 4. Self Help Group model in *K. alvarezii* cultivation in Tamil Nadu coast

Fig. 5. Raft ready for harvest

Average yield per raft (12 x 12 feet) is 240 to 260 kg. They retain 60 kg as planting material for the next crop. If 240 kg of seaweed is dried, it results in 24 kg dry weight (Fig. 6). The current price is ₹ 2.50 per kg on wet weight basis and ₹ 18 to 20 per kg on dry weight basis. A fisherman family earns around ₹ 9000 per month (if hired labour is engaged @ ₹ 100 per raft). In this farming mostly family labour is involved, hence a fisherman family earns around ₹ 12000 per month (Table 2).

Fig. 6. Seaweed dried in sandy beach

Income model for one cycle (45 days)

Table 2. Income generation in one culture cycle of 45 days

Particulars/Description	Cost (₹)
Strength of SHG – 5 nos. per group	
Number of harvest per day	One raft
Seaweed biomass harvest per day (wet weight) (retaining 2700 kg as seed for the next crop)	9,000 kg
Seaweed dry weight @ 10:1 ratio dry weight basis	900 kg
Selling price @ ₹ 20 per kg (20 x 900)	18,000
Selling price excluding technical labour cost @ ₹ 100 per raft (100 x 45 = 4,500*)	13,500
Income of SHG member per day	300
Income of SHG member per month	9000
Income for 4 cycles in the 1st year per SHG member (Approximately 200 days)	60,000
Income for 6 cycles in the 2nd and 3rd year per SHG member (Approximately 150 days per year)	90,000

**Mostly family labour is involved*

***K. alvarezii* production in Tamil Nadu coast**

From the year 2003 to 2009, *K. alvarezii* production has shown a steady increase from 147 t to the maximum of 865 t in the year 2009 (Fig. 7). A decline in production was noted in 2010, which may be due to heavy storm and high temperature. At present, around 1000 to 1200 families are dependent on *K. alvarezii* farming for their livelihood in Tamil Nadu coast. Around 180 and 70 families in *Sambai* and *Mangadu* village respectively in Ramanathapuram District, depend entirely on *K. alvarezii* farming for

their livelihood. In these villages there are around 8000 seaweed culture rafts floated in the Palk Bay region.

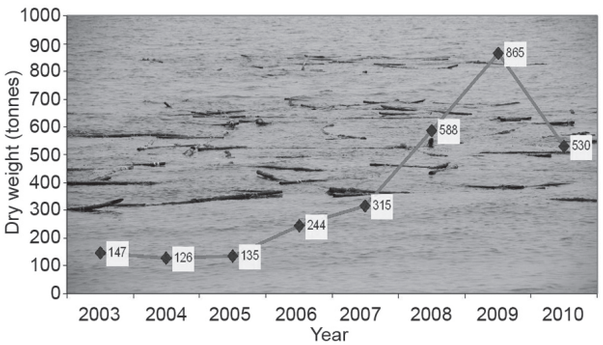

Fig. 7. Seaweed (*Kappaphycus alvarezii*) production in Tamil Nadu (2003-2010)

Constraints in *K. alvarezii* farming

Grazing

Nibbling by herbivores like siganid, acanthurid, sea urchin and starfish on tips of branches is the major problem faced by the seaweed farmers (Fig. 8). During the month of May – June, the grazing intensity is more, which affects the yield up to 50-80%.

Epiphytism

It is the attachment of undesirable seaweeds to the cultured species (Fig. 9), which is common among tropical seaweeds that usually occur at the onset of monsoon brought by change in water temperature, trade wind and water movement. Availability of limited substrate for the drifting seaweeds contribute to epiphytism that compete for space, nutrient and sunlight. During the month of May – June, majority of the seaweed farmers face this problem.

Fig. 8. Portion of *K. alvarezii* grazed by herbivores

Fig. 9. Bamboo raft with *K. alvarezii* completely covered by *Lyngbya* sp.

Disease

Diseases are generally caused by low salinity, high temperature, and light intensity. When the plant is under stress whitening of the branches occurs, which results in crop loss (Fig. 10).

Fig. 10. Bleached seaweed fragments

Apart from the above mentioned problems, natural calamities like heavy storm and cyclone cause complete damage to *K. alvarezii* farming.

The acceptance of this farming practice is indicative of the fact that a low cost simple technology, which can provide substantial returns, can find a better adoption among the coastal fisherfolk. There still exists a controversy regarding the exotic status and the invasive nature of *K. alvarezii.* The current introduction of *K. alvarezii* to Tamil Nadu coast for farming by CSMCRI was of exotic origin. Bioinvasion of *K. alvarezii* on branching corals (*Acropora* sp.) in the Krusadai Island of Gulf of Mannar has been reported. The fear of bioinvasion of the seaweed is mainly based on the propagation through spores. However, it has been reported that the propagation through spores is not viable in the case of *K. alvarezii*. Incidental observations based on short-term studies

are noted on invasive nature of *K. alvarezii*. Therefore, it is premature to comment on the adverse impacts of *K. alvarezii* on corals, sea grass and associated organisms. Long-term investigations are required for making conclusive remarks on the invasive nature of *Kappaphycus* on coral reef ecosystem. It is also suggested to undertake a research programme with integrated and multi-stakeholder approach involving researchers, seaweed farmers, traders, industrialists, conservators and fisheries developmental agencies to investigate the impact of *Kappaphycus* farming on the livelihood of fisherfolk and coastal environment.

Cephalopod fishery of Visakhapatnam - trend and present status

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Andhra Pradesh contributes nearly 8% to the total marine fish production of India. The cephalopods contribute a little over 1% to the total marine fish landings of Andhra Pradesh. In Andhra Pradesh, cephalopods are landed by large trawlers (12-14 m, 98/110 HP), known as sona boats and smaller trawlers (9.5-10 m, 68/90 HP). Total cephalopods landed during the period 2000-2010 was 23629 t and the total effort was 37399153. Cephalopod production increased from 1011 t in 2000 to over 2300 t in 2002. Thereafter there was a declining trend up to 2006. In 2006-2007, the production increased to over 2500 t. In 2008, there was a drastic decline. However, there has been an increasing trend in production in 2009-2010 (Fig. 1). Cephalopods contributed 0.53% in 2000 and 1.6% in 2010, to the total marine fish landings of Andhra Pradesh (Fig. 1). The annual average cephalopod production for the period was 2148 t, forming an average 1.04% of the total marine fish landings in Andhra Pradesh. Squids and cuttlefish contributed to the cephalopod landings; however, Octopus landings were insignificant.

The trend and present status of the cephalopod fishery at the Visakhapatnam Fishing Harbour during the period 1998-2010 are detailed here. The total cephalopod production in Visakhapatnam during 1998-2010 was 12113.6 t with an average annual production of 931.8 t. The cephalopod production during 1998-2003 was less than 1000 t; thereafter the production increased to nearly 1400 t and 2010 recorded a steep increase to 2193 t (Fig. 2). The total effort during the period was 16810029 and average annual effort was 1293079. The effort also increased over the period from 139462 in 1998 to 2461167 in 2010. The average catch per unit effort was 1.03 Kg. The CPUE was very low during 2002 – 2006, although the effort was high (Fig. 2). In Visakhapatnam, cephalopods are landed by the large trawlers (sona boats) and small mechanised boats (SMBs). The landings by the sona boats and the

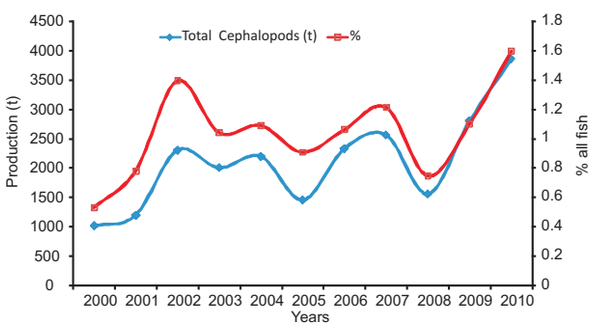

Fig. 1. Cephalopod landings in Andhra Pradesh (2000-2010)

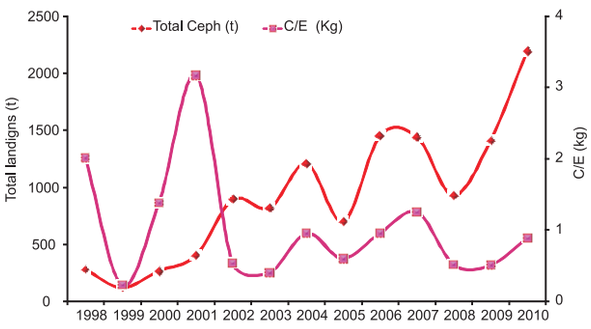

Fig. 2. Landings of cephalopods Visakhapatnam Fishing Harbour (1998-2010)

small mechanised boats are shown in Fig 3. The SMBs contributed to the cephalopod landings during 1998 -2003, however, from 2004 onwards the contribution of the larger trawlers increased tremendously in Visakhapatnam (Fig. 3). The small mechanised trawlers contributed 58.3% during 1998 to 2001 while sona boats contributed 63.4 % of the cephalopod landings during 2002-2010. (Fig. 3). Active fishery begins by June and peak landings occur during June to September (Fig. 4).

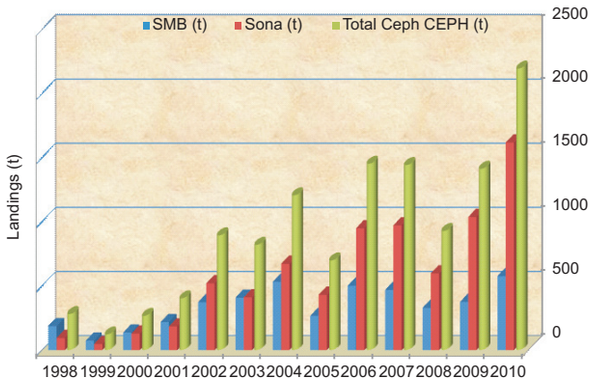

Fig. 3. Landings of cephalopods by Sona and SM boats at Visakhapatnam Fishing Harbour (1998-2010)

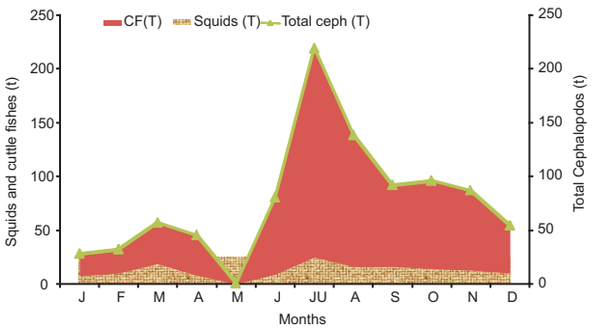

Fig. 4. Average monthly landings of cephalopods (1998-2010)

Squids contributed 20.5%, while cuttlefish contributed 79.8% to the total cephalopod landings in Visakhapatnam during the period 1998-2010. Octopus landings were negligible. Among cuttlefish, *Sepia pharaonis*, *S. aculeata*, *Sepiella inermis* and occasionally *S. elliptica, S. brevimana* and *S. prashadi* were landed in Visakhapatnam. *S. aculeata* contributed 34.22% while *S. pharaonis* 29.6%, S. inermis 9.6%, Loligo *duvauceli* 20.54% and the rest 6.23% to the total cephalopod landings in Visakhapatnam during the period. Among squids, *L. duvauceli* contributed entirely to the squid landings. Stray numbers of *L. yuii* and *Sepiotuethis lessoniana* were observed. Octopus species did not contribute significantly to the fishery in Visakhapatnam. During 1998-2010 periods, *L. duvaucelii* was dominant species from 2008 to 2010. During 2002 to 2007, *S. aculeata* was the dominant species contributing to the fishery and *S. pharaonis* from 2008 to 2010 (Fig. 5).

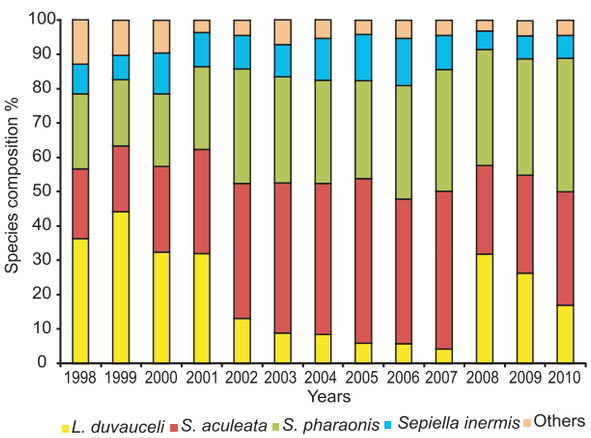

Fig. 5. Species composition (%) during 1998-2010

Over the decade, the production of cephalopods has shown drastic fluctuations in annual landings. However, there is an increasing trend with increase in demand for exports. The price of *S. pharaonis* is ₹ 220 to ₹ 230 per kg, *S. aculeata* is priced at ₹ 220 per kg, while *S. inermis* costs ₹ 80-100 per kg. *L. duvauceli* is priced at ₹ 50-60 per kg.

Cephalopod fishey of Maharashtra State

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Cephalopods comprising of squids, cutlefishes and octopuses form the most valuable fishery resource in the world second to the prawns. The production of cephalopods was less in the traditional

fisheries but after the introduction of trawling in the inshore waters, cephalopod exploitation experiences new strides and the export market for cephalopods tremendously increased ever since (Silas *et al*., 1985). In India, the commercial exploitation of cephalopods started about 35 years ago. In Maharashtra, cephalopods are mainly exploited by shrimp trawlers and the landings stand second in all India production. With increased mechanisation and expansion of fishing grounds, trawl nets have become the principle gear used for exploiting them. More than 95% of the cephalopod production in the state is caught by the multi-day fleet (MDF). Almost all the cephalopod catch is exported and only a very small percentage is marketed in fresh condition for domestic consumption.

Since cephalopods are an exportable commodity fetching high price, it has become the second most important revenue earner after shrimps for the trawl fishermen of the state. Because of the economic importance of cephalopods and as they form one of the important marine fishery resources, the various aspects of cephalopod fishery in the state is presented. Maharashtra is also one of the leading maritime states in cephalopod production in India. From 1960 (12 t) onwards, the cephalopod production from the coastal waters of Maharashtra state showed a rising trend with a peak landing of 31,353 t in 2003 but after 2004, a steep declining trend was observed and presently the catch stands at 14,014 t in 2009 (Fig.1). The percentage of cephalopods in all fish landings in the state ranged from 0.1% in1968 to 9.7% in 2009. The present paper deals with the cephalopod fishery of Maharashtra State during the period 2000-2009. Catch data was not available between 1st June to 15th August since the mechanised fishing operations were suspended in the state due to southest monsoon and the trawling ban imposed by the goverment.

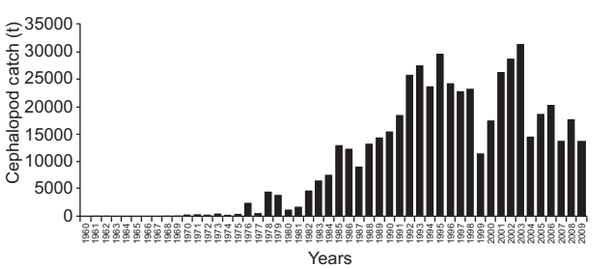

Fig. 1. Annual cephalopod cach in Maharashtra from 1960 to 2009

Maharashtra has a total 720 km of coastline with 0.89 lakh sq.km of continental shelf and the major gears being operated from the state are trawl nets, purse seines, gillnets, *dol* nets and hoook and lines (Singh and Kuber, 1998).

The dominant species occuring in commercial catches in Maharashtra are *squid - Loligo duvauceli* (Indian squid) (Fig. 2), cuttlefish (Fig. 3), *Sepiella inermis* (spineless cuttlefish) (Fig. 4) and octopus - *Cistopus indicus* (old woman octopus) (Fig. 5). Apart from these commercial species, sporadic occurrence of *Sepia prashadi, Loliolus investgatoris, Onychoteuthis banski, Sthenoteuthis oualaniensis, Thysanoteuthis rhombus, Octopus membranceus, Euprymna berryi etc.* were also oberved. However, these cephalopod species did not form sizable seasonal fushery during September-December (Sundaram *et al.,* 2006). The major cephalopod

Fig. 2. Heap of Indian squid, *Loligo duvauceli* at NFW, Maharashtra

Fig. 3. Bumper landings of Pharaoh cuttlefish, *Sepia pharaonis*

Fig. 4. Sorting of *Sepiella inermis* at the landing centre for marketing

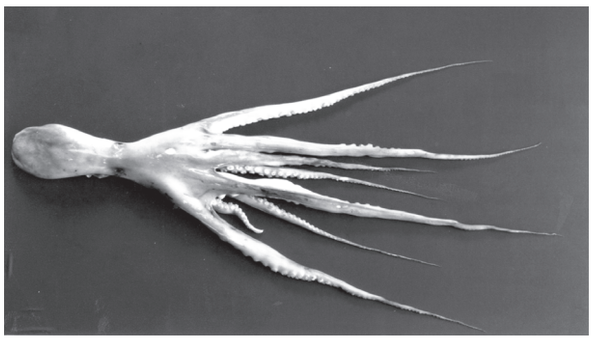

Fig. 5 . Dominant species of octopus, *Cistopus indicus*

landing centres of Maharashtra, New Ferry Wharf (Fig. 6), Sasoon Docks and Versova, which accounts for nearly 60% of Maharashtra landings (Annam and Sindhu, 2005) is situated in Mumbai. The trawlers operating from these landing centres use 22-25 m otter trawl, with 25 mm cod end mesh size. The fishing grounds extend from Ratnagiri in south to Dahanu in north (17° to 20° N and 72° to 73° E) with in a depth range of 40-80 m (Kuber and Deshmukh, 1992).

Fig. 6. New Ferry Wharf Fish Landing Centre, Mumbai, Maharashtra

The annual cephalopod production in the state during 2000 to 2009 ranged between 17,390 and 14,014 t (Fig. 7). From 2000 to 2003 there was a steady increase, in fact in 2003, the landings of cephalopods in Maharashtra was the highest ever (31,3553 t). From then on there was a gradual decline but the catch rate seems to be increasing. The CPUH of cephalopods ranged from 2.37 kg/h (2000) to 3.49 kg/h (2009) (Fig. 7). The total efforts ranged from 24,4473 (2000) to 15,0215 (2009). The landing data from New Ferry Wharf for the period 2000-2009 were pooled to arrive at the species composition (Fig. 8). The important species of cephalopods, which contributed to the trawl catches, were *L. duvauceli* (52.3%) among squids, *S. aculeata* (Fig. 9) (18.5%), *S. pharonis* (16.4%), and *S. inermis* (10%) among cuttlefishes. Octopus (dominated by C. *indicus*) contributed 2.7% during this period and the landings of octopus have been rising steadily over the years due to its recent economic and export importance (Sundraram and Sarang, 2004). Currently the price structure at the landing centre (BFW) for *L. duvauceli* is Rs. 100-120/kg, *S. aculeata* 60-80/kg, *S. pharonis* Rs. 130-160/kg, *S. inermis* 30-40/kg and *C. indicus* 50-70/kg.

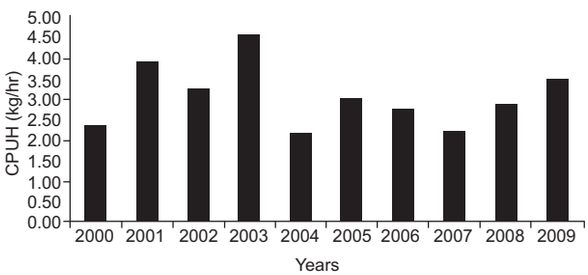

Fig. 7. Catch rate of cephalopods in Maharashtra (2000-2009)

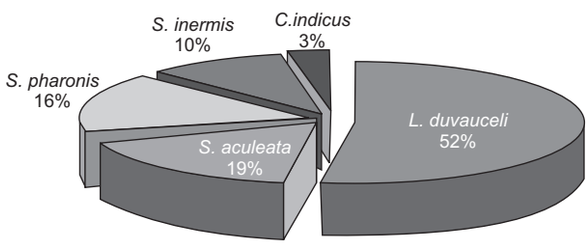

Fig. 8. Species composition of cephalopods in Maharashtra (2000-2009)

Fig. 9. Carch of *Sepia aculeata* by trawlers at NFW

According to Nair *et al.* (1992), the seasons for cephalopod fishery are the pre-monsoon (February-May), the monsoon (June-August) and the post-monsoon (September-January). As per the CPUH estimated for all the commercialy important species (2000-2009), it was observed that the peak period for squids is pre-monsoon, cuttlefish is post-monsoon and Octopus almost throughout the year. A major peak period of abundance for *L. duvauceli* was observed during March- April and a minor peak in October, while for all the three cuttlefish species namely *S. aculeata, S. pharaonis* and *S. inermis,* the peak period of abundance was in the month of October. Octopus species showed period of abundance in April (Fig.10) Silas *et al.*, 1985) presented a detailed account of fishery of cephalopods at Mumbai and a very interesting seasonal pattern in cephalopods was observed wherein squids dominated the cephalopod catch during the period January to May and cuttlefishes were abundant during the period September to December. A similar trend was observed by Kuber (1987) from Mumbai waters and the present studies also revealed a similar pattern.

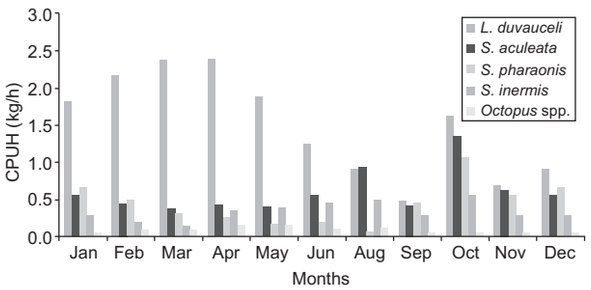

Fig. 10. Period of abundance of cephalopods as per CPUH from Maharashtra (2000-2009)

From above mentioned observations on cephalopod fishery of Maharashtra State, if can be inferred that as the demand is increasing, over-exploitation due to increased fishing pressure is possible, which may ultimately lead to stock depletion. It is suggested that measures should be taken at this stage for rational exploitation of this important resource and therefore it is imperative to evolve effective fishery management measures for judicious exploitation.

Emerging ringseine fishery of oilsardine (*Sardinella longiceps*) off Puducherry coast

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Puducherry Union Territory has 45 km of coast which extends from Kanagachettykulam in the north to Murthykuppam in the south and contributes around 5% to the total marine fish catch of the country. The average annual catch was 15,492 t during 2005 – 2009. One of the most significant development in the marine fisheries sector observed in recent years is the large scale introduction of ringseine boats for commercial exploitation of pelagic fish resources, which is also observed along the coast off Puducherry. The operation of indigenous shore seine (*Thallu valai* in Tamil) has virtually come to a halt due to introduction of ring seine nets (*Surukku valai* in Tamil). In order to help the fishermen who are wholly dependent on the shore seine operations, the scheduled banks have come forward with credit

facilities to both individual and fisheries co-operative societies for acquiring ring seines units. The ring seine operation is restricted to area off Veerampattinam and Periyakalapattu near the Puducherry Fisheries Harbour, mainly due to availability of infrastructural facilities *viz*., berthing, ice plants, cold storage, freshwater, diesel pumps, trucks for transportation *etc.*

The Indian oilsardine, *Sardinella longiceps*, which contributes 15 to 20 % to the total marine fish landings in India and which occurs in large shoals along the south-west coast was reported only as stray catch from the east coast before 1980. There was no report of heavy catch of the oilsardine from Puducherry coast in ringseine except the report of Chidambaram (*Mar. fish, Infor. Ser. No*. 61) on the unusual occurrence of the oilsardine in gillnet catches during the period Oct. - Dec. 1983. The present report gives a brief account of the unusual landing of oilsardine in bulk quantities by ring seines at Puducherry Fisheries Harbour during April – September, 2010.

Mode of operation

The ring seines are either operated from boats with wooden or fibreglass hulls with an overall length of 38 to 43 ft. The knotless synthetic net has a length of 400 to 600 m and a height of 50 m. About 40 brass rings are used for pursing the net. Crew of ringseines varies from 20 to 25 excluding crew (2-3) of a carrier boat, which is employed during the peak fishing season to cope up with transport of fish from the fishing ground to the landing place. Nearly 15 ring seiners operated off Puducherry coast for the first time during April – Sept. 2010. The time taken to complete a haul varied from 1 to 3 h depending upon the catch. On an average 3-4 hauls were made daily. As there is a heavy demand to sell fish catch in the morning, atleast 1-2 hauls were made and the fish is sent immediately by carrier boats for better financial returns.

Composition of catch

By and large, oilsardine, mackerel, tunas, carangids, anchovies and other fishes constituted the major catch of ring seine. The estimated catch of ring seines during the study period is shown in Table I.

Table 1. Estimated landings of ring seines and CPUE (in tonnes) at Puducherry Fisheries Harbour during April– Sept, 2010

Month	Effort (units)	Catch (t)	CPUE (t)
April	450	2250	5.0
May	600	4800	8.0
June	480	1920	4.0
July	300	900	3.0
August	150	150	1.0
September	100	80	0.8

The catch of 2250 t in April increased to 4800 t in May and thereafter gradually declined to 80 t in September. A similar trend was noticed in CPUE also; with catch of the highest 8 t recorded in May and the lowest 0.8 t in September.

Month-wise catch and percentage of fish groups caught by ringseine is shown in Table 2. The catch of oil sardines ranged from 72 to 3,840 t (73 to 92 %), mackerel from 3 to 384 t (2 to 8 %) and tunas between 2 and 288 t (2 to 10 %). The carangids, anchovies and other fishes contributed 1 to 6 % of the overall catch.

Table 2. Month-wise catch (t) and composition (%) during 2010

Species	April		May		June		July		August		September	
	Catch (t)	%	Catch (t)	%	Catch (t)	%	Catch (t)	%	Catch (t)	%	Catch (t)	%
Oilsardine	1755	78	3840	80	1555	81	219	73	138	92	72	90
Mackerel	135	6	384	8	77	4	12	4	3	2	4	5
Tunas	225	10	288	6	134	7	60	20	8	5	2	2
Carangids	67	3	240	5	78	4	6	2	0	0	1.5	2
Anchovies	45	2	0	0	58	3	0	0	0	0	0	0
Other fishes	23	1	48	1	18	1	3	1	1	1	0.5	1

Truck loaded with ringseine

Boat with ringseine in the harbour

Carrier boat with oilsardine catch

Iced sardine being loaded into the truck at Puducherry Fisheries Harbour

Biological note on the important commercial species

Sardinella longiceps **:** Length ranged from 137 to 178 mm with the dominant mode at 167 mm. Preponderance of females over males was observed in all the months except July. Mature females were found throughout the period except May.

Rastrelliger kanagurta : Size ranged from 170 to 235 mm with majority of them in the 220 mm size group.

Euthynnus affinis : Size ranged from 240 to 510 mm.

Economics

Based on the auction proceeds at the landing centre, the total amount realized during April-September worked out to Rs. 24.7crores with a monthly revenue of Rs. 0.2 to 16 crores. The average return per boat/day was estimated as Rs.1,23,550/. Mackerel fetched the highest price with an average of Rs.100/kg. Price per kg for oilsardine was Rs. 20/-, tunas Rs.30/-, carangids Rs.50/-, anchovies Rs. 40/- and others Rs.20/-. This formed about 60% of the total annual income. Category-wise catch and total value realized are given in Table 3.

Table 3. Category-wise catch (t) and value (Rs. in crore)

Species	Catch (t)	Value in Rs. crore
Oilsardine	8176	16
Mackerel	615	6
Tunas	717	2.2
Carangids	395	2
Anchovies	103	0.5
Other fishes	94	0.2

Oilsardine fetched Rs.16 crores, followed by tunas (Rs. 6 crore), mackerel (Rs. 6 crore), carangids (Rs. 2 crore), anchovies (Rs. 0.5 crore) and other fishes (Rs. 0.2 crore). Though April – May was the lean period for trawlers, the indigenous fishermen were able to earn a good income during this period than earlier years, on account of this fishery.

As there was an unusual heavy landing of pelagic fishes and high economical returns, many more ring seine units are likely to be operated in the same area in the coming months. Hence, a detailed investigation on the effect of purseseining on constituent species is warranted for sustaining the pelagic fishery resources of the state.

Whale shark landings in Uttar Kannada, Karnataka

Miriam Paul Sreeram, V. S. Kakati, N. G. Vaidya, C. K. Dinesh and S. V. Pai
Karwar Research Centre of CMFRI, Karwar

The whale shark, *Rhincodon typus* Smith, 1828, has a circumglobal distribution in tropical and warm temperate seas. Since May 2003 it has been included under Appendix II of CITES, making the trade of this species regulated. The status of this species has since then been upgraded from “Data deficient” in 1996 to “Vulnerable” in 2000 by the IUCN. Currently it is protected under Schedule I Part II of the Wildlife Protection Act of India, 1972.

Two instances of the landing of whale sharks have been observed in the Uttar Kannada District in the 2007-09 period. Both landings were recorded in the month of January, with one on 27.01.07 at Baithkol, Karwar and the second at Gabitwada near Ankola on 31.01.09. The specimen landed at Baithkol (Fig. 1) was brought in by fishers who found it entangled in a bottom set gillnet at approximately 45 m depth off Karwar Lighthouse. It was dragged to

Table 1. Morphometric parameters of whale shark specimen landed in Uttar Kannada (2007-09)

Morphometric measurements (cm)	Jan 2007		Jan 2009	
	(cm)	(% TL)	(cm)	(% TL)
Total length (TL)	259.1	100	427	100
Standard length	Not recorded		320	74.9
Head length	,,		72	16.9
Snout to first dorsal	,,		183	42.9
Snout to second dorsal	,,		259	60.7
Snout to pectoral	,,		82	19.2
Snout to pelvic	,,		196	45.9
Snout to anal	,,		220	51.5
Length of first dorsal fin	33.02	12.7	45	10.5
Base length of first dorsal fin	25.4	9.8	Not recorded	
Length of second dorsal fin	20.32	7.8	,,	
Base length of second dorsal fin	10.16	3.9	,,	
Length of pectoral fin from angle of inner base to tip	50.8	19.6	69	16.2
Pectoral fin base length	Not recorded		37	8.7
Length of pelvic fin	,,		19	4.5
Pelvic fin base length	,,		15	3.5
Eye diameter	,,		5	6.9 (% HL)
Inter orbital space	,,		80	18.7
Gill slits	05		05	
Ribbings	Not recorded		08	

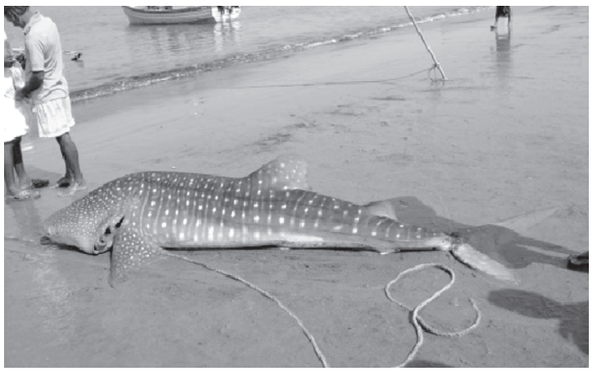

Fig. 1. Juvenile whale shark (*Rhincodon typus* Smith, 1828) landed at Baithkol beach on 27th January 2007

the Baithkol beach by boat with a nylon rope tied to its caudal peduncle, leading to a sharp cut, resulting in a wound. The whale shark, though alive, was bleeding from its mouth . The fishers were aware that the fish could not be marketed. With persuasion by the CMFRI staff, who also cautioned them that it was illegal to catch this species, it was released back into the sea.

As per the fishers of Gabitwada, the second whale shark was also found entangled in a gillnet. It was also brought to the shore by dragging by the tail resulting in a deep cut on the caudal peduncle. An attempt was made to market the fish but the effort was abandoned once the fishers became aware that catching the said fish was an offence. According to some fishers of the area there exists a market for its fins and flesh, though not locally.

Both the specimen captured were juveniles. The claspers of the specimen landed in Gabitwada did not extend beyond the anterior margin of the pelvic fin.

So far the majority of landings of the whale shark on the west coast have been from December to April. Two earlier landings of whale sharks at Karwar were on 17.01.81 (at Anjadip Island, female of total length of 8.1 m) and on 18.03.83 (at Karwar beach, total length 5.35 m). The present occurrences of whale sharks fall within this season. Telemetric studies could yield better data of the migration of whale sharks in the Arabian Sea.

First record of two spot razor fish, *Xyrichtys bimaculatus* (Ruppell, 1828) at Mangalore, Karnataka

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Mangalore Research Centre of CMFRI, Mangalore

Wrasses come under the family Labridae, with majority of the species having a maximum length of less than 20 cm. Common in shallow waters in a variety of habitats, including bare sand and rock, grass and algae-covered bottoms and coral reefs. they have a wide distribution and are known to occur in the Atlantic, Indian and Pacific waters. Wrasses are active only during day time, burrowing in the sand and sleeping in rock or coral shelters at night. The genus *Xyrichtys* is observed and recorded for the first time at Mangalore.

Fishes of the genus *Xyrichthys* have the top of head and snout compressed into a knife like edge and the first two rays are often seperated from the rest of the fin by a deep notch in the fin membrane or is completely detached. they have protrusible mouth, outward jutting teeth with gaps between teeth, moderately large cycloid scales, dorsal fin with 8-15 spines (often 3) followed by 7-18 rays. Size, shape and colour vary, hence they are very popular as aquaria fish. Generally they change colour and sex with growth, from an initial phase of males and females, they change to an often brilliantly coloured terminal male phase. Most species are sand burrowers; carnivores on benthic invertebrates; also planktivores, and some small species are known to remove ectoparasites of larger fishes. the present specimen identified as *Xyrichtys bimaculatus* (Fig.1) was collected from the catch at Mangalore Fishing Harbour on 27th August 2010. It was observed as a stray specimen along with threadfin breams. The morphometric and meristic characterstics are given in Table 1.

Table1. Morphometric and meristic characteristics of *X. bimaculatus*

Morphometric/ meristic characteristics	Measurements (mm)/counts
Total length	139
Standard length	116
Head length	38.8
Snout length	7.07
Inter-orbital width	6.23
Eye diameter	8.34
Dorsal length	84.65
Pectoral length	28.64
Pelvic length	24.02
Caudal fin length	42.65
Body depth (maximum)	43.55
Dorsal fin count	XIV+19
Anal fin count	VI+7
Weight	31 g

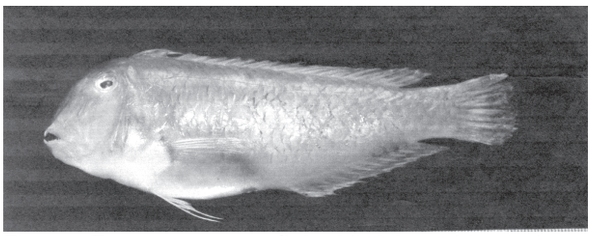

Fig. 1. Two spot rasor fish, *Xyrichtys bimaculatus* (Ruppell, 1828) landed at Mangalore, Karnataka

Xyrichtys bimaculatus has been misidentified and known by some of these synonyms *Hemipteronotus hypospilus* Schultz,1960, *Hemiperonotus punctulatus* (Valenciennes, 1840), *Iniistius bimaculatus* (Ruppell, 1829), *Novacula punctulata* Valenciennes, 1840, *Xyrichtys hypospilus* (Schultz, 1960), *Xyrichtys punctulatus* (Valenciennes, 1840).

The collected specimen has been preserved in the Marine Museum of the Mangalore Research Centre of Central Marine Fisheries Research Institute.

First record of cuttlefish *Sepia* (*Doratosepion*) *kobiensis* Hoyle, 1885 from the north-west coast of India

Sujit Sundaram
Mumbai Research Centre of CMFRI, Mumbai

Cephalopods are caught mainly as by-catch in the bottom trawl and due to the growing demand for cephalopods in the international market, they are exploited all along the Indian coast. In Maharashtra, cephalopods are mainly exploited by shrimp trawlers and stand second in the alll India production. The main fish landing centres for cephalopods at Mumbai are New Ferry Wharf (NFW) and Sassoon Docks. Cephalopods contribute 10.6% towards the total fish catch in Maharashtra (CMFRI, 2009)

With the increased exploitation and expansion of fishing grounds, new records of cephalopods are reported from places all along the Indian coast. Out of the 60 cephalopod species recorded from the Indian waters, only 15 are commercially expolited (Silas *et al*., 1985). A new entrant to the cephalopod fishery was observed in trawl landings at New Ferry Wharf and stray occurrences were observed at Sassoon Docks. The depth of operation was about 30-40 m at 70-80 km off north-west coast. Specimens were brought to the laboratory for identification. The species was identified as *Sepia* (*Doratosepion*) *kobiensis* Hoyle, 1885 (Fig. 1 and 2) commonly called as 'Kobi cuttle fish' based on the identification characters as described in Roper *et.al*. (1984). The

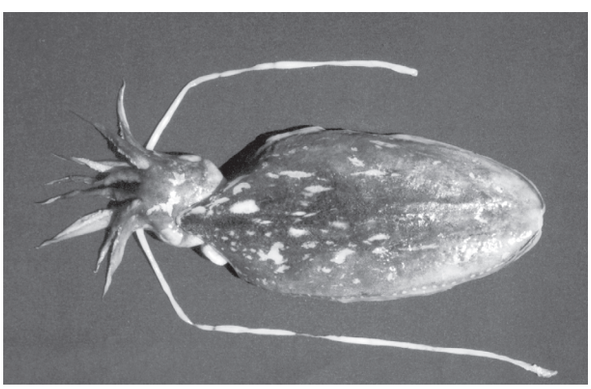

Fig. 1. Dorsal view of *Sepia (Doratosepion) kobiensis* Hoyle, 1885

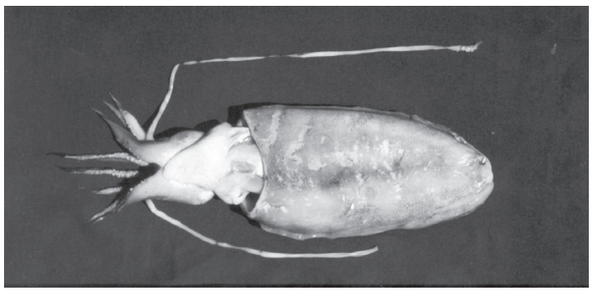

Fig. 2. Ventral view of *Sepia (Doratosepion) kobiensis* Hoyle, 1885

occurrence of *S. Kobiensis* is reported for the first time from this region. the species entered the fishery in Mumbai waters from the year 2001 to 2008 and the peak landings were observed in 2003. After 2008 the species was not observed at the landing centres. The occurrence was hingly seasonal and constituted a fishery during the period October-December with peak landings during November. Dorsal mantle length (DML) of 482 specimens were measured at the NFW landing centre during the period 2001 to 2008. The estimated mean for this period was 92.4 mm and a mode was observed in the size group 90-99 mm (Fig. 3).

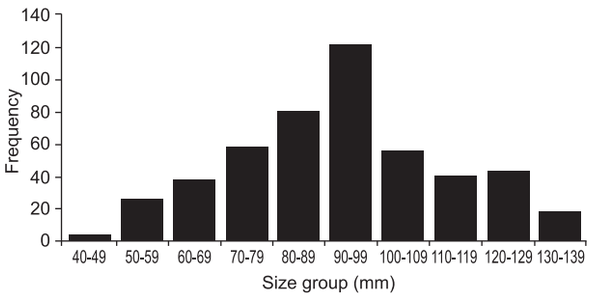

Fig. 3. Size frequency polygon of *Sepia kobiensis* landed at NFW, Mumbai, Maharashtra

Taxonomic position of the species is Class: Cephalopoda, Subclass: Coleoidea, Infraclass: Decapodiformes, Superorder: Decabrachia, Order: Sepiida, Family: Sepiidae and Genus: *Sepia*. *S. kobiensis* is a demersal cuttlefish inhabiting up to 160 m depth. It is known to be distributed worldwide in Western Pacific: South China Sea, East China Sea, and Yellow Sea to southern and central Japan (Roper *et al*., 1984).

The mantle is elliptical with a mantle width 45-47% of the mantle length. The antero-dorsal margin is acutely and triangularly protruded, while the ventral margin is gently concave. The fins are narrow, starting below the mantle opening and is about 86% of mantle length. The funnel is slender, reaches the base of the ventral arms and the funnel valve is short and conical in shape. The arms are tapering to fine points and the arm formula is usually 4:1:2:3. Swimming membrane is poorly developed in the ventral arms. The arms are short, attenuate and subequal. The arm suckers are globular quadriserial with those in the median rows larger than the marginal ones. Left arm in males is hectocotylised and suckers are greatly reduced in size. The oral surface is hollowed out and transversely ridged. Tentacles are long and thin, tentacular club short and narrow. Tentacular suckers are arranged in eight rows transversely with five suckers of the third longitudinal row much larger than the others. Swimming keel is broad extending proximally beyond base of club and the protective membrane is poorly developed.

The cuttlebone is lanceolate and largest in the striated zone area (Fig. 4 and Fig. 5). Shell taper towards the posterior end, acuminate at the anterior end and has a very narrow chitinous margin. The dorsal surface has faint median rib, whereas, the ventral surface has a median groove forming a broader depression in the anterior part of the loculus. The inner cone has narrow lateral limbs and the posterior portion is elongated. A cup-like widening formed by the outer cone surrounds the inner cone. The spine is long and directed upwards. The animal is dark brown in colour with the exception only in the

Fig. 4. Dorsal view of cuttle bone of *Sepia* (*Doratosepion*) *kobiensis* Hoyle, 1885

Fig. 5. Ventral view of cuttle bone of *Sepia* (*Doratosepion*) *kobiensis* Hoyle, 1885

periphery and the fins, where the chromatophores are very minute and distally placed with prominent small dots on the rim. The ventral side is pale in colour due to fewer chromatophores.

Twenty eight specimens were brought to the laboratory for biological analysis. Dorsal mantle length (DML) was measured using a digital caliper and total weight (± 0.01g) determined using an electronic balance after the specimens were dried on blotting paper. Measurements were taken as described in CMFRI Manual (1995). Stomach condition was ascertained as per Kore and Joshi (1975). Food items were in well-crushed and macerated condition and therefore were categorised into groups such as 'fishes' *etc*. The Index of preponderance was estimated as suggested by Natarajan and Jhingran (1961). Maturity studies were carried out as per Silas *et al*. (1985).

The DML ranged from 35-130 mm and the corresponding body weight ranging from 18.812 - 56.421 g (Fig. 6). According to Roper *et al.* (1984) the maximum mantle length is 90 mm and Okutani (1987) has reported the maximum dorsal length as 70 mm. Dorsal mantle length of the specimens collected from New Ferry Wharf seems to be larger than those occurring in other coasts. Majority had

Fig. 6. Length range of *Sepia* (*Doratosepion*) *kobiensis* Hoyle, 1885 from Mumbai waters, Maharashtra

guts with 'trace' and 'empty' condition and the food was finely macerated. The species seems to mainly feed on 'prawn' (70%) followed by 'fish' (20%) and digested matter (10%). About 60% of the specimens were in 'mature condition', 20% 'gravid' and 20% 'immature'.

Some cephalopods are known to make seasonal migrations, which are influenced by breeding activity. It seems that in all probability this species may have come to nearshore waters for breeding. Regional distribution and relative abundance of different species of cephalopods have not been studied extensively along the Indian coast and therefore efforts need to be taken in this direction to create a database.

First record of bandfish, *Acanthocepola limbata* (Valencienness, 1835) from Malabar region

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The family Cepolidae comprises of 23 species of fish in five genera, all of which are found in eastern Atlantic and wide spread in central Indo-Pacific. The species *Acanthocepola limbata* (Valencienness, 1835) is a meso bathypelagic species distributed circumglobally. In the Indian waters, it has been recorded from Karwar (Kulkarni and Balasubramanian, 1978).

The fish reported here was observed in the trawl discards collected from Puthiappa on 16.8.2010 (Fig.1). The specimen was collected during trawling operations carried out between 11° 14'19" N and 74° 56'12" E off Tellichery at a depth of 160 m. The specimen measured 268 mm in total length and weighed 84 g. Morphometric measurements of the specimen is given in Table 1.

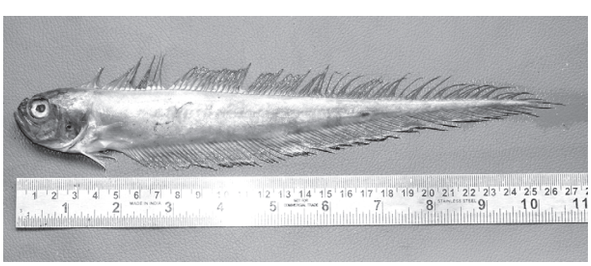

Fig. 1. Bandfish, *Acanthocepola limbata* landad at Puthiappa Fisheries Harbour

Table 1. Morphometric measurements of *Acanthocepola limbata* collected from Puthiappa

Parameters	Measurements (mm)
Total length	268
Standard length	249
Head length	35
Snout	9
Eye diameter (Same along both axes)	8
Eye (middle dark portion)	5
Maxillary length	15
Mandibular length	10
Snout to insertion dorsal	24
Length of dorsal	218
Snout to insertion pectoral	28
Length of pectoral	19
Snout to insertion pelvic	22
Length of pelvic	16
Snout to insertion anal	37
Length of anal	204
Length of caudal	18
Snout to vent	34
Snout to origin of lateral line	42
Gape	14
Depth of body in line with eye	22
Depth of body at dorsal insertion	29
Depth of body at pectoral insertion	27
Depth of body at pelvic insertion	28
Depth of body at anal insertion	26
Depth of body at mid-length	20
Depth of body at caudal insertion	10
Inter-orbital distance	7
Distance between eyes	13
Breadth of body at dorsal insertion	15
Breadth of body at mid-length	7
Width of gill opening	28

The specimen was identified to species level using the FAO fish identification sheets **(**Fischer and Bianchi,1994)**.** The body is elongate, laterally compressed and gradually tapering to caudal. Last soft ray of dorsal and anal fins connected to caudal fin by a membrane. Scales cycloid, small, present on head and opercle. Eyes red, large and protractile. Mouth large, oblique; upper jaw broad at end, without supramaxilla, and extending to below posterior margin of eye with triangular tongue. Mouth has a single row of slender, slightly curved teeth in jaws and median palatine teeth. Preopercle bluntly serrated. Gill openings wide and semicircular. A single long dorsal fin originates on head. Dorsal and anal fins join with the caudal. Colour of the body red with golden yellow bands on sides. A dark red blotch on dorsal between 9th and 14th rays.

New records of two finfish species from Indian waters

Molly Varghese and Mary K. Manisseri
Central Marine Fisheries Research Institute, Kochi

Two species of fishes, namely *Ablabys binotatus* (Family Tetrarogidae) and *Rhinopias eschmeyeri* (Family Scorpaenidae) were recorded in trawl (Roller madi) landings from the Gulf of Mannar, south-east of India, which are the first reports from India.

Ablabys binotatus (Peters, 1855) collected from the coral reef areas (Fig.1) is dark brown in colour, with white blotch on body above pectoral fin and characterized by the presence of 15 dorsal spines, 8 dorsal soft rays, 3 anal spines and 5 anal soft rays.

The systematic position of this species is:

Order : Scorpaeniformes
Family : Tetrarogidae
Genus : *Ablabys* Kaup, 1873
Species : *Ablabys binotatus* (Peters, 1855)

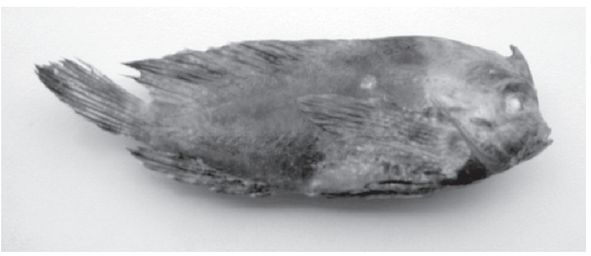

Fig. 1. *Ablabys binotatus*

The specimen has a Standard length of 87 mm and body depth of 33.22 mm. It is recorded earlier from Maldives, Mozambique, South Africa and Tanzania. Synonyms of this species are *Amblyapistus binotata, A. binotatus, A. marleyi, A. taenionotus* and *Apistus binotatus*.

Rhinopias eschmeyeri Condé, 1977 collected from the coral reef areas (Fig. 2) during the present study is reddish in colour, has 12 dorsal spines, 9 dorsal rays, 3 anal spines and 5 anal rays.

Fig. 2. *Rhinopias eschmeyeri*

The systematic position of this species is:

Order : Scorpaeniformes
Family : Scorpaenidae
Subfamily : Scorpaeninae
Genus : *Rhinopias* Gill, 1905
Species : *Rhinopias eschmeyeri* Condé, 1977

Two specimens were collected from Gulf of Mannar, the standard lengths of which were 122.5 mm and 128 mm. The species is distinguished by the presence of one small black spot, slightly greater than pupil diameter, in the middle of the membrane between the seventh and eighth dorsal-fin soft rays; dorsal profile of snout curved, initially convex, then deeply concave; interorbital space deep, occipital pit moderately deep; 16 pectoral-fin rays, with the distal margins of the spinous portion of the dorsal fin and soft-rayed portions of the dorsal, pelvic, anal and caudal fins very weakly notched, membrane of the spinous portion of the dorsal fin notably fleshy, tips of each caudal-fin ray divided into four branches and dorsal-fin spines relatively soft with tips bending easily under slight pressure. This species is reported earlier from Australia, Indonesia, Japan, Mauritius, Philippines, Reunion, Seychelles and Vietnam. The synonyms of this species are *Rhinopias eschemeyeri* and *R. frondosa.*

Marine litter in the coastal environment of Mangalore

Bindu Sulochanan, G. Subramanya Bhat and S. Lavanya
Mangalore Research Centre of CMFRI, Mangalore

The continuous flow of large quantities of plastics and waste from land and sea based sources result in a gradual build up of litter in the marine and coastal environment. Plastics and other man-made objects cause serious impacts on environment, economics, safety and health. Worldwide, millions of marine mammals, birds, turtle and fish perish as a result of entanglement or ingestion of discarded debris. Marine litter spoils beaches, floats on the sea surface, drifts in the water column due to the current and is also found on the deep sea bed.

Monitoring of the three beaches in Mangalore *viz*., Chitrapur, Panambur and Thaneerbhavi has shown that Chitrapur has the highest rate of marine litter of 901.5g/m^2 (Fig. 1) followed by Thaneerbhavi 689.85 g/m^2 and Panambur 83.33 g/m^2. The items in the marine litter varied (Fig. 2) consisting of ice cream spoons, caps, toothbrush, plastic straw, small bottle caps, plastic sachets, nylon ropes, plastic mats, slipper, shoes, thermocole, sponges *etc*. The size of

Fig. 1. Marine litter in Chitrapur beach

the plastic debris ranged from 0.01 cm to 110 cm. The changing profile of the beach with seasonal shifts and highly eroding coastline takes the marine debris directly to the sea. The sandy beaches looses its binding ability during the dry weather phase and buries part of the marine litter. This can then leach into the soil and cause further health hazard by contaminating the water column.

Fig. 2. Variety of plastics found in the beach

In Mangalore, an examination of the guts of oilsardine and mackerel (Fig.3 and 4) revealed nylon ropes of length 1 mm to 4 mm. Sardines and mackerel being plankton feeders, it could have accidentaly ingested along with the plankton. UNEP has estimated that in the Central Pacific there are 3 kg of marine litter for every kilogram of plankton. Off Mangalore, it was estimated that at present there are 0.00168 kg of plastic for every kg of plankton. Plastic covers are often mistaken for the feed of turtles as it resembles jellyfish, a food item of turtles. Experimental trawling in grounds off Mangalore also indicated the presence

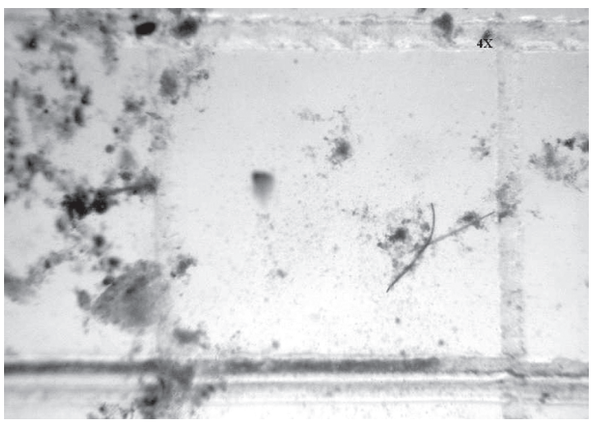

Fig. 3. Plastic strands of less than 0.05 mm observed in the gut of oilsardine along with digested food

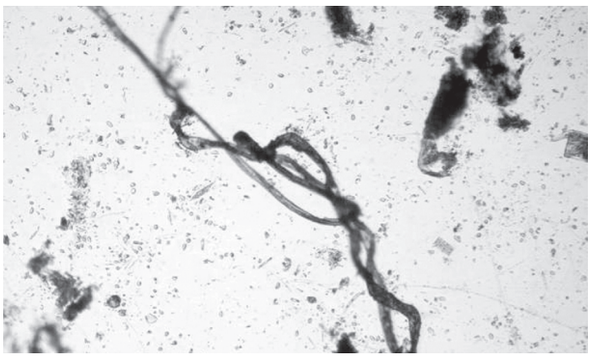

Fig. 4. Plastic strand found in twisted form in the gut of Mackeral along with digested copepods

of marine litter (Table 1). Benthos collected from the coast off Chitrapur beach using Petersen grab indicated the presence of plastic strands (Fig. 5) entangled along with polychaete larvae.

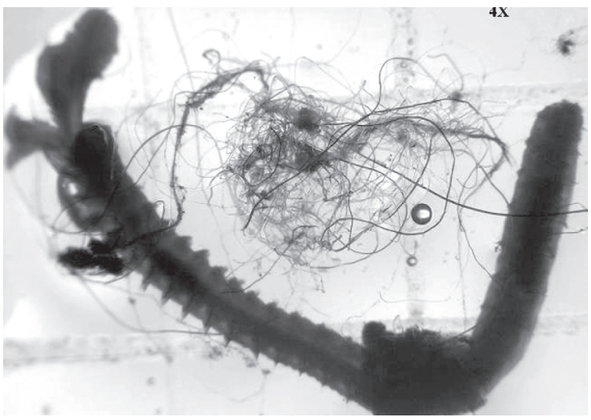

Fig. 5. Polychaete larvae entangled with assorted plastic and nylon bits

Marine litter is entirely due to human activity and therefore can and has to be controlled by human management. The best way is to reduce plastic usage at source and also prevent the waste from reaching the coastal environment. Public awareness combined with better solid waste management can help protect our environment. A lesser consumerist attitude can go a long way in preventing marine litter build-up.

Table 1 Ouantity of plastic obtained in trawling ground off Mangalore for two months in the year 2010

Station	Starting station	Ending station	Time duration of trawling	Depth in m	Plastic in g/m²
1	N 12° 48‘ 995" E 74° 42‘ 796"	N 12° 50‘ 349" E 74° 42‘ 099"	45 min	18-28	0.48486
2	N 12° 50‘ 934" E 74° 42‘ 410"	N 12° 50‘ 495" E 74° 43‘ 709"	45 min	12-13	1.21215
3	N 12° 50‘ 708" E 74° 45‘ 043"	N 12° 49‘ 705" E 74° 46‘ 240"	45 min	9-10	0.40405

Occurrence of trigger fishes at Chennai

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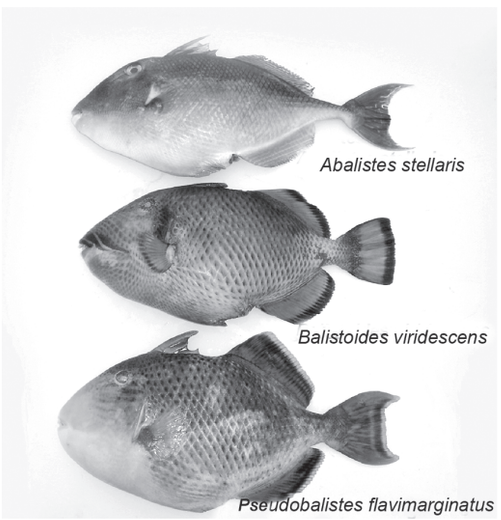
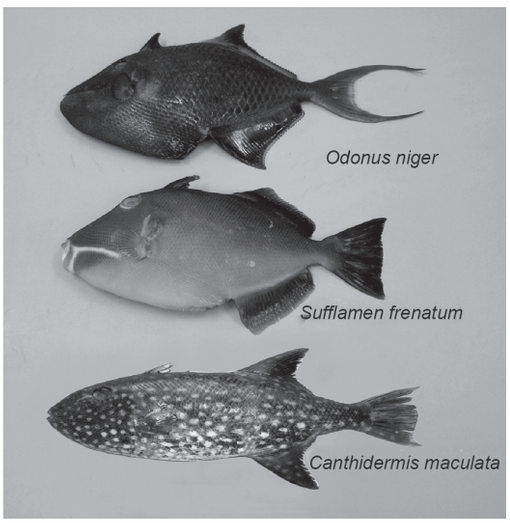
At Kasimedu Fisheries Harbour, Chennai the following trigger fishes belonging to Balistidae family were landed by mechanised multiday Thangal trawlers operated at a depth of 60-80 m:

- *Odonus niger* (Ruppel, 1840) - Red fang trigger fish
- *Canthidermis maculata* (Bloch, 1786) - Rough trigger fish





- *Abalistes stellatus* (Lacepede,1798) - starry triggerfish
- *Balistoides viridescens* (Bloch & Schnider 1801) dotty trigger fish
- *Pseudobalistes flavimarginatus* (Ruppel, 1829) yellow margin trigger fish
- *Sufflaman fraenatum* (Latreille, 1804) - masked trigger fish

An estimated catch of about 1.8, 1.2 and 0.8 tonnes of trigger fishes were landed by multiday Thangal trawlers during July, August and September 2008, 2009 and 2010 respectively. Among the trigger fish catches, *A. stellatus* dominated the catch (Table 1) followed by *O. niger* and *C. maculata*. The morphometric measurements of three species of trigger fishes are given in Table 2. Trigger fishes are sold @ Rs. 20-30/kg. Fishes are de-skined and sold to local hotels for human consumption.

Table 1. Species composition, catch particulars and size distribution of trigger fishes landed at Kasimedu Fishing Harbour, Chennai

Species	Year				Size range	Weight range
	2008	2009	2010	%	(mm)	(g)
A. stellatus	680	500	320	39.0	390-470	980-1600
B. viridescens	270	120	80	12.2	340-360	640-720
P. flavimarginatus	130	80	0	5.5	375-410	820-1140
S. fraenatum	110	50	0	4.2	300-350	520-680
O. niger	330	320	200	22.1	125-190	50-120
C. maculata	280	160	220	17.1	225-310	150-280
Total	1800	1230	820	100	-	-

Table 2. Morphometric measurements of trigger fishes (mm) landed at Kasimedu Fishing Harbour, Chennai

Parameters	*A. stellatus*	*B. viridescens*	*P. flavomarginatus*
Total length	410	355	378
Standard length	320	300	295
Snout to 1st dorsal	120	125	120
Snout to 2nd dorsal	205	200	200
Snout to pectoral	110	110	110
Snout to pelvic	192	190	195
Snout to anal	220	225	225
No. of teeth	8+8	8+8	8+8
Eye diameter	20	18	18
No. of grooves on caudal peducle	5	6	6
No. of grooves below eyes	-	-	6
No. of grooves near snout	-	-	4

Occurrence of ascidian *Molgula* sp. from the coastal waters of Visakhapatnam, India

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Ascidians referred to as 'sea squirts' constitute a major component of biofouling community in coastal waters. Knowledge of diversity of ascidians in the waters around India is very less. Perusal of literature by Renganathan (1990), Venkat *et al.* (1995), Meenakshi and Senthamarai (2004, 2006) and Meenakshi (2005) indicate that there are about 300 species of ascidians belonging to 10 families and 38 genera reported so far from Indian waters comprising both colonial and solitary forms. Bhavanarayana and Ganapati (1971) studied the ascidian species among pelagic tunicates from the inshore waters of Visakhapatnam.

A single specimen of the ascidian was handpicked while collecting the seaweed *Caulerpa racemosa* from a rocky substratum on the intertidal area of Thotlakonda, Visakhapatnam (17°49'N, 83°25'E). It was preserved in 70% (v/v) ethanol. The body was translucent, light coloured and robust measuring 10 mm in length, and 8 mm in breadth. Test was thin, smooth with no adhering sand but stiff and quite opaque. This species had a curious external form, posterior end, being narrow and pointed, while the anterior was broad and flat (Fig. 1). Body was pyriform, compressed laterally and was not attached. The anterior end was wide, straight, truncated and had an inconspicuous aperture at each extremity. The branchial aperture was rather the more anterior and prominent of the two and was directed ventrally; the atrial aperture was quite sessile, and anteriorly pointed. The dorsal and ventral edges were both convex. The widest point was at about one-third of the length from the anterior end and from this point the two edges tapered rapidly to the narrow posterior end. Intestine

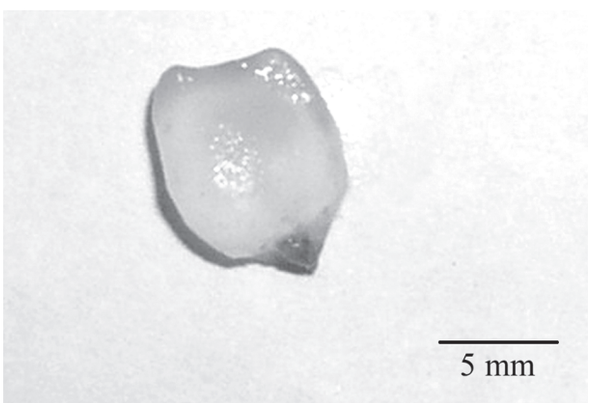

Fig. 1. *Molgula* sp.

was firmly attached to the mantle on the left side which is rather characteristic of the molgulid and it became clearly visible from the outer surface. The specimen was identified as *Molgula* sp. (Herdman, 1882). Class Ascidiacea, order Pleurogona and family Molgulidae.

Since the study here pertains to only a single specimen, identification needs to be further confirmed upto species level. Previous records on tunicates of Visakhapatnam region are mostly of Doliolidae and Salpidae families which occur as 5% of the benthic fauna (Vijaykumaran, 2003). The recovery of this specimen, though accidental, from the seaweed beds tends to focus on the fact that due to some disturbance like trawling, dredging and/ or shipping; the specimen may have, dislodged off from its habitat and thus settled in the *Caulerpa* bed. Hence the presence of more numbers of this species in deeper waters along this region cannot be ruled out. This can be corroborated with the findings of Menon *et al.* (1977) that ascidians were absent in the fouling community at Mangalore Port prior to the commissioning of the harbour and further confirmed by Venkat *et al.* (1995) by citing their dominance in macrofouling community in this region after commencement of the operations at the port. If introduction is the possible reason for the present observation of *Molgula* sp., one of the most likely sources could be the emigrants brought in by the shipping activity and ballast water discharge (Scheltema and Carlton 1984) for which Visakhapatnam is so famous for (Visakhapatnam Port Trust, 2009). A detailed study is needed to see the biodiversity loss as well as any addition of macrofouling fauna in Visakhapatnam region.

Occurrence of dusky sweeper *Pempheris adusta* Bleeker, 1877 in Ratnagiri waters, Maharashtra

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Pempheris adusta Bleeker, 1877, commonly called 'dusky sweeper' (Fig. 1), generally live on coral reefs and form schools in large caves among rocks. On 19/08/2009, a good number of specimens of *P. adusta* were observed at Mirkarwada landing centre in Ratnagiri (Fig. 2). They had elliptical, compressed body with iridescent, coppery silver colouration, because of which they were spectacular in appearance. The specimens were brought to the laboratory for identification and detailed study. The total length ranged between 110 and 116 mm and the corresponding weight ranged from 17 g to 19 g. These fishes were landed by trawlers operating in 10-25 m depth at about 10-20 km towards south-west coast off Ratnagiri.

Fig. 1. *Pempheris adusta*

Fig. 2. Catch of *Pempheris adusta*

Pempheris adusta is placed under the Super Class: Osteichthyes, Class: Actinopterygii, Subclass: Neopterygii, Infraclass: Teleostei, Superorder: Acanthopterygii, Order: Perciformes, Suborder: Percoidei and Family: Pempheridae.

Pempheris adusta Bleeker, 1877 was identified on the basis of the following characters: compressed, elliptical body with short and blunt snout with strongly oblique protractile mouth; dorsal fin with 6 spines and 8 soft rays; anal fin with 3 spines and 42 soft rays; pectoral fin with 1 spine and 19 soft rays; body depth 2.1 in standard length, eye diameter 2.27 in head length; coppery brown in coloration with silvery tinge; a black blotch at the base of pectoral and blackish dorsal tip as mentioned by Smith and Heemstra (1986).

The distribution of this species is in the Indo-West Pacific Ocean from south of Transkei, South Africa and east to New Guinea. This is the first record of the species from Ratnagiri waters, Maharashtra. Since these fishes live among coral reefs in the caves and rocks, it is possible that they drifted from the shelter of Angria Bank off Vijaydurg-Ratnagiri coast. Angria Bank is a shallow sunken atoll 40 km from north to south and 15 km from east to west (with depth of 20 m below surface water) on the continental shelf off the west coast located 105 km west of Vijaydurg, Maharashtra. The bank is steep on all sides with great depths surrounding it (Anon, 2003). It is one of the largest underwater reefs with 57 species of macro-algal fauna (Dhargalkar *et al.*, 2001). Therefore, the reef may have abundant fish fauna which remained unexplored. The coppery brown coloration *P. adusta* with silvery tinge may be to camouflage predators like perches, eels and carangids which abound in Ratnagiri waters.

Smith and Heemstra (1986) mentioned 15 species in the Indo-Pacific waters under the genus *Pempheris* but described only 3 species namely *P. schwenkii* Bleeker, 1855; *P. mangula* Cuvier, 1829 and *P. adusta* Bleeker, 1877. Distribution and occurrence of the species belonging to the family Pempheridae in Indian waters is given in Table 1.

Table 1. Report of the species of the family Pempheridae

Author	No. of species	Name of species	Synonyms	Place of occurrence
Smith and Heemstra (1986)	3	*P. schwenkii*		Indo-west Pacific, south to Natal
		P. mangula	*P. molucca* *P. oualensis*	Indo-west Pacific, south to Porto Amelia
		P. adusta	*P. adustus* *P. oualensis* *P. onalensis*	Indo-west Pacific, south to the Transkei
Talwar and Kacker (1984)	3	*P. vanicolensis*		Phillipines, Australia, Port Blair in Andaman sea
		P. moluca	*P. mangula*	Central Indo Pacific,
			P. malbarica	Andaman sea
			P. oualensis	
Day (1878)	2	*P. mangula*	*P. otaitensis* *P. vanicolensis*	Seas of India
		P. Molucca	*P. malabarica*	Red sea, Seas of India
Jones and Kumaran (1980)	1	*P. oualensis*		South Africa, Lacccadives, Indonesia, Phillipines and Australia
Murty, Easterson and Fernando (1969)	1	*P. oualensis*		Minicoy

In the FAO identification species sheets for fisheries purposes, Fischer and Bianchi (1984) have mentioned four species under the genus *Pempheris viz., P. moluca* Cuvier, 1831, *P. oualensis* Cuvier, 1831, *P. schwenkii* Bleeker, 1877 *and P. vanicolensis* Cuvier, 1831 in area 51 (Northern Indian Ocean and Arabian Sea). Therefore, 15 species mentioned by Smith and Heemstra (1986) needs re-examination. A thorough taxonomic revision of the available species can solve the discrepancies.

Occurrence of starry blowfish, *Arothron stellatus* from Kasimedu Fish Landing Centre, Chennai, Tamil Nadu

S. N. Sethi, S. Rajapackiam and N. Rudhramurthy
Madras Research Centre of CMFRI, Chennai

The blowfish, locally called as “Pethai” are generally believed to be poisonous. Certain internal organs and sometimes their skin are highly toxic to most animals when eaten, nevertheless the meat of some species is considered a delicacy in Japan (as *fugu*) and Korea (as *bok*), when prepared by chefs who know what is safe to eat and in what quantity. Puffer fish is eaten safely worldwide simply by killing and gutting the fish while it is fresh. The starry puffer fish is white with numerous small black spots that become relatively smaller and more numerous as the fish grows.

The blowfish is placed under order Tetraodontiformes, class: Actinopterygii and family Tetraodontidae

Distribution

Family Tetraodontidae contains at least 121 species of puffers in 20 genera. They are most

Table 1. Morphometric characteristics of puffer fish *Arothron stellatus*

Parameters	Measurements (mm)	Parameters	Measurements (mm)
Total length	550	Anal fin width	40
Standard length	465	Snout to anus	330
Snout to first dorsal fin length	320	Snout to spiracle length	55
Dorsal fin height	88	Snout to eye length	90
Dorsal fin width	45	Eye diameter	20
Snout to first pectoral fin length	160	Body width at head	120
Pectoral fin height	50	Body width at pectoral fin	130
Pectoral fin width	50	Body width at middle	150
Pectoral fin curve	80	Mouth length	60
Pectoral fin curve	105	Lower teeth height	29
Snout to first anal fin length	350	Upper teeth height	29
Anal fin height	68	Total body weight (kg)	4.3
Anal fin curve	75		

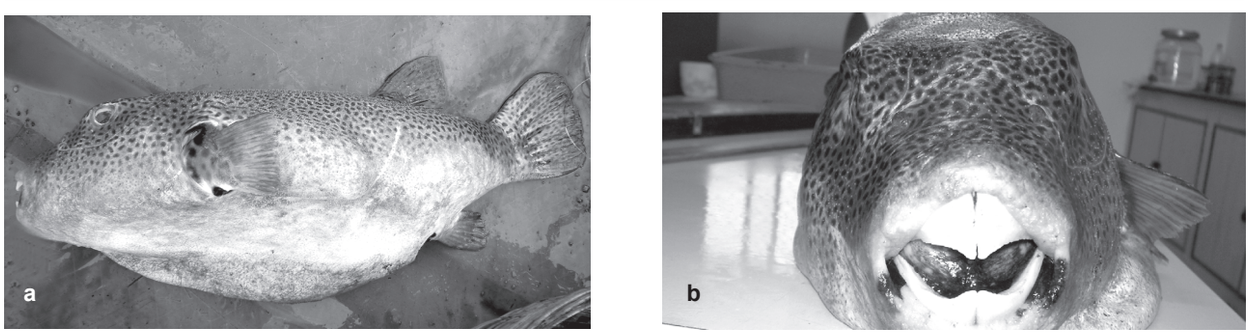

Fig. 1 a and b. Starry blow fish *Arothron stellatus* from Kasimedu Fish Landing Centre, Chennai

diverse in the tropics and relatively uncommon in the temperate zone and completely absent from cold waters. The starry pufferfish occurs in tropical marine waters of the Indo-Pacific. On 07.07.2010 these fishes were caught by gillnetters from Kasimedu Fish Landing Centre, Chennai (Fig.1 a and b).

Food and feeding habits

The puffer fishes are omnivorous though a large part of their diet is meat food. They are reported to eat various invertebrates, crustaceans, molluscs and seaweeds. The gut contents showed more of molluscs and crab shells in broken form and the total gut content weighed on an average about 400 g (Fig. 2).

Fig. 2. Gut content of *A. stellatus* showing more of broken molluscs and crab shells

Occurence of hammer oyster, *Malleus albus* near Nachikuppam, Chennai

S. N. Sethi and P. Poovannan
Madras Research Cenre of CMFRI, Chennai

The hammer oyster, *Malleus albus* is placed under Class Bivalvia, Subclass Pteriomorphia, Order Pterioida, Superfamily Pteriacea, Family Malleidae. The oyster is locally called *suti ali.* These oysters (Fig. 1 a and b) were caught by fishermen from Nachikuppam, 1-2 km off Chennai using *Nakkuvalai,* a bottom set gillnet, at a depth of 5-7 fathoms. The maximum and minimum shell length was 156 mm and 77 mm and the average length and weight were 117 mm and 29 g respectively. The two-part shell is thick and T-shaped. Inner surface of the shell has a large muscular scar and periostracum white in colour. The hinge is on the 'horizontal' portion of the 'T' and the valves held shut by one large adductor muscle at the cross of the 'T'. Ligament with prominent hinge teeth. The inner shell is partially lined with mother-of-pearl. Byssus threads are produced near the hinge. Most live in the crevices of coral rocks or on reef flats, in tropical regions. Dead shells are mostly used for making crude lime.

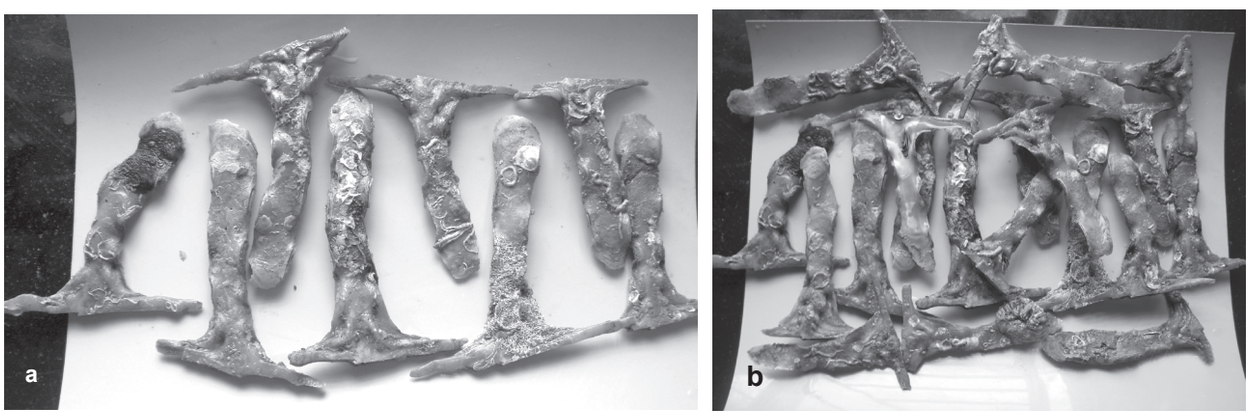

Fig. 1 a and b. Hammer oyster, *Malleus albus* collected from Nachikuppam, Chennai

Unusual bumper catch of shrimps at Nochikuppam, near Chennai, east coast of India

G. Mohanraj, P. Thirumilu, S. Rajapackiam, P. Poovannan, S. Mohan, G. Srinivasan, S. Gomathy, R. Vasu and M. Ravindran
Madras Research Centre of CMFRI, Chennai

Sporadic occurrence of penaeid shrimps consisting exclusively of *Fenneropenaeus indicus* (Indian white shrimp–*Vella eral*/*Por eral*), *F. merguiensis* (banana shrimp – *Vella eral*/*Sunnambu eral*), *Penaeus semisulcatus* (green tiger shrimp – *Valayampoota era*l/*motta eral*/*vari eral*/ flower), *Penacus monodon* (giant tiger shrimp – *Kotteral*/*Kathamba eral*/*kara*) are usually recorded by indigenous gears like single-layer gillnet (*Pannu valai*) and three-layer trammel net (*Disco valai*/*Mani valai*). In these nets the shrimp catch rate vary from 2 to 5 kg/unit, while in the trawl net, shrimps form 10 to 15 % of the annual total fish along the Chennai coast. However, an unusual bumper catch of shrimps to a tune of 22.8 t was landed by trammel net at Nochikuppam Landing Centre near Chennai during 10th - 14th December.

Shrimp catch

Trammel nets were operated from fibre glass boats in the depth range of 6 to 8 m, 1 km away from the shore off Nochikuppam. On 10th December 2008, shoals of shrimps were sighted which prompted the fishermen of that area to start the operation of trammel nets. Fishing continued up to 14th December 2008 and the catch was mainly of Indian white shrimp (*F. indicus*). The details of the catch are given in Table 1.

Table 1. Catch details of shrimps

Date	No. of units operated	Estimated catch (t)	Catch/ unit (kg)	Estimated value in Rs. lakhs
10.12.08	150	9.2	61.33	27.6
11.12.08	130	6.8	52.31	20.4
12.12.08	180	4.0	22.22	12.0
13.12.08	140	2.4	17.14	7.2
14.12.08	110	0.4	3.64	1.2
Total	710	22.8	32.11	68.4

The number of units operated on 10th December (first day) was 150, which increased to 180 on 12th December (second day) and reduced to 110 on the last day (14th December) of operation. However, the shrimp catch was the highest (9.2 t) on the first day, which gradually decreased to the lowest of 0.4 t on the last day, which may be due to either capture of majority of shrimp population or the movement of shrimp shoals from the fishing ground. The recorded water temperature, salinity, dissolved oxygen and pH of surface water in the fishing area was 29.5 °C, 26.13 ppt, 3.716 ppm and 6.89 respectively. The catch per unit also showed a similar trend (highest–61.3 kg on first day to the lowest – 3.64 kg on the last day). In the 5 day operation, a total of 22.8 t of shrimps with total value of Rs. 68.4 lakhs was realized.

Species composition

The catch was exclusively penaeid shrimps, of which, *F. indicus* formed 95 % (Fig. 1 and 2), followed by *P. monodon* (3%) and *P. semisulcatus* (2%).

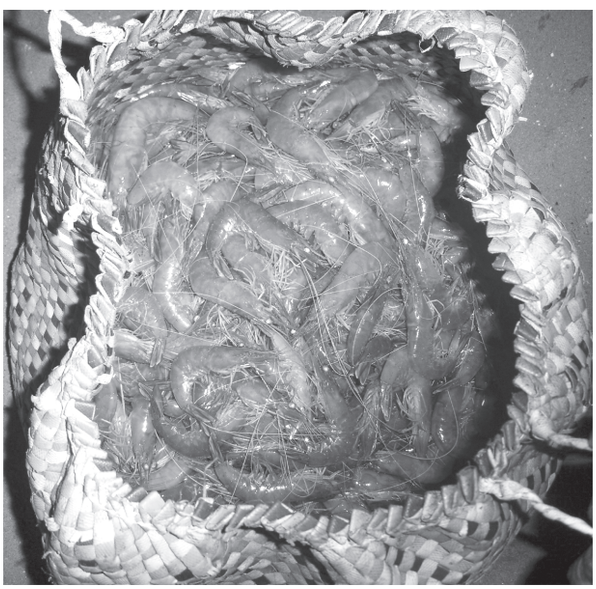

Fig. 1. Part of the bumper shrimp catch at Nochikuppam

Fig. 2. Close-up view of *F. indicus* catch

Biological observation on *F. indicus*

The catch was composed mainly of fairly large sized shrimps and the head-on count varied from 30 to 40 per kg for females and 35-45 per kg for males. The size (total length) ranged from 115-180 mm with the dominant modes at 141-145 mm and 161-165 mm for females and 131-175 mm with dominant mode at 150-155 mm for males. Females dominated (60%) the catch. Most of the females were found with late maturing and matured gonads.

Remarks

There are several reports on unusual bumper catches of penaeid shrimps off Maharashtra coast (Ramamurthy and Mestry 1983,1985; Jadav 1996; Rao 1998; Rao 2005); off Goa coast (Kulkarni *et al*. 1987); Karnataka coast (Kakati and Dinesh, 1991); Mohamed *et al*., 1996; Arghekar, 2000); off Tamil Nadu coast (Kathirvel *et al*., 1985; Sankaralingam, 1989) and off Paradeep coast in Orissa (Brar, 1995). Most of these observations were related to heavy landings of penaeid shrimps for shorter periods (4 to 7 days), either by indigenous or mechanised gears during post-monsoon months. The present observation on the bumper catch of Indian white shrimp (*F. indicus*) off Chennai during the post north-east monsoon period may be a part of moving shoals from north to south utilising the prevailing southerly water currents.

Unusual heavy landings of jellyfish *Crambionella stulhamani* (Chun) and processing methods at Pulicat landing centre, Chennai

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Introduction

Jellyfish exist in all oceans across the world. They exist from the surface of the water to the very depths of the ocean. Jellyfish are free-swimming planktonic carnivores. There are about 1000-1500 known species of jellyfish and new ones are being discovered everyday. This is surprising as jellyfish are amongst the oldest living creatures in the world and have been in existence before the dinosaurs.

Fishery

Unusual heavy landings of Jellyfish *Crambionella stulhamani* (Chun) at Pulicat landing centre near Chennai was recorded on 7th August 2009. Locally this type of jellyfish are called as "Muttai Chorri". An estimated catch of 540 t of jellyfish tentacles were landed without head portion. Each animal having eight number of tentacles, the size range of single tentacles was from 130 to 170 mm. For the first time, the tentacles of jelly fish were used for processing and for value added techniques. The jellyfish catch started from 10.8.09 to 27.8.09 and a heavy catch of 60 t was observed on 18.8.09. Fisherfolk of eleven fishing villages such as Arangamkuppam, Kottaikuppam, Vairavankuppam, Sathankuppam, Lighthousekuppam, Thirumalnagar-kuppam, Sempasapalallikuppam, Gunamkuppam, Andikuppam, Kavimanalkuppam and Nadukuppam were involved in this fishery.

The agent gave an advance of Rs.50,000 per boat for fishing the jellyfish. The Head of the village restricted the fishing of jellyfish to 15 gunny bags of jelly fish tentacles per boat, in order to benefit fishermen. Each boat engaged 5-6 fishermen, two persons to scoop the jelly fish and remaining persons to cut off the head portion and

dispose it. The jelly fish fishery occured off Pulicat at distance of 5-6 km within a depth of 6-7 fathoms. The tentacles of jelly fish were brought in 15 gunny bags (Fig. 1 and 2), each bag containing 50-60 kg which was priced at Rs. 500/ per bag. In this process each boat got an income of Rs.7500 per day after operating for 5 to 6 h.

Fig. 1. Tentacles of jellyfish

Fig. 2. Loading bags with tentacles

and the same were placed in the tank for 3-4 h. During the second stage, the tentacles were collected (Fig. 3) in perforated plastic tub and then pressed. The unwanted mucus and sand particles were removed from the tentacles by forcing filtered seawater (Fig. 4). During the third stage, the cleaned and fresh tentacles were transferred to cleaned,

Fig. 3. Transfer from storage tank

Fig. 4. Cleaning with filtered seawater

Processing methods

Processing of jellyfish tentacles for export is well developed and carried out under hygienic conditions. Permanent cement tank with asbestos sheet shed is now used instead of thatched shed in fishing villages along the entire Tamil Nadu coast. Formerly the jelly fish head portion was only used for processing and export. But for the first time at Pulicat, the tentacles of jelly fish were used for preparing value added products. It involves four stages. In the first stage the tentacles were washed and cleaned hygienic 1.5 t cement tank with the addition of 75 kg common salt and 50 kg Ammonium sulphate for 18- 24 h (Fig. 5). Salinity was maintained within 28-32 ppt. Occasionally lime powder is also added to maintain the pH level. In the final fourth stage, the sample was ready for packing (Fig. 6) with 3-5 kg air tight plastic container. The agents handled 500-1000 tubs of tentacles per day. Nearly 60-80 labourers were engaged for the processing work and an amount of Rs.300-400 per day/labour was paid. Utilising this method, five companies were involved

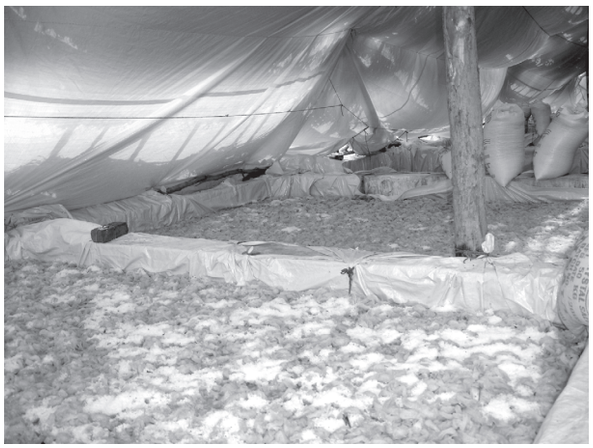

Fig. 5. Preservation with salt

Fig. 6. Processed jellyfish ready to export

in the processing and export of tentacles from Pulicat. The processed, jellyfish is packed in air tight plastic containers so that it does not get spoiled until 5-6 months. The foreign importer places the order only after ensuring the quality of processing methods in hygienic condition.

Spurt in the landings of crabs along northern Tamil Nadu and Puducherry coasts

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The marine crab fishery by mechanised trawlers along the north Tamil Nadu (Chennai and Cuddalore) and Puducherry coasts is mainly supported by those belonging to the genera *Portunus* and *Charybdis* of the family Portunidae. Species like *Portunus sanguinolentus, P. argentatus, P. gladiator, P. pelagicus, Charybdis natator, C. lucifera, C. variegata* and *Podopthalmus vigil* are commercially important. Of these, until the end of October 2008, there were remarkable changes in the landing pattern of trawl fishing along the north Tamil Nadu and Puducherry coasts. The same change of pattern was also seen in indigenous gears such as gillnet, operated near the shore, locally called as *Nandu valai* and *Kallu valai* in the depth range of 5 – 10 m. In multiday long voyage trawl fishing, crabs were caught in deeper waters up to 100 m. In single day fishing, the fishermen operated up to 50 - 60 m. In the crab exploitation there was heavy landings of *P. sanguinolentus* and other portunid crabs along the Tamil Nadu coast, while other fish categories were poorly caught during the period. A brief account of unusual heavy landings of the portunid crabs is reported here.

Landings

The total landings of crabs varied from 0.04 t to 48.75 t at Chennai (Kasimedu) with CPUE of 0.14 – 125.0 kg/h. In Puducherry, the catch ranged from 0.6 t to 29.4 t and CPUE 1.4 – 76.7 kg/h, while at Cuddalore, it varied from 1.9 t to 17 t with CPUE 6.1 – 35.4 kg/h. The daily average landing of crabs at Chennai was 23.9 t with a CPUE of 58.6 kg/h. In Puducherry, the daily average landing was at 15.7 t with a CPUE of 42.1 kg/h, while at Cuddalore, it was 12.4 t with a CPUE of 27.7 kg/h. Details of crab landing at Chennai, Puducherry and Cuddalore are given in Table 1.

Table 1. Estimated crab catch landings (t) at Chennai, Puducherry and Cuddalore during 29th Oct - 1st Nov 2008

Centre / Date	Chennai					Puducherry					Cuddalore				
	Total No. of fishing hours	Total catch (t)	Catch/h (kg)	Crab (t) (%)	Fish (t) (%)	Total No. of fishing hours	Total catch (t)	Catch/h (kg)	Crab (t) (%)	Fish (t) (%)	Total No. of fishing hours	Total catch (t)	Catch/h (kg)	Crab (t) (%)	Fish (t) (%)
29.10.08	390	75	125.0	48.75 (65)	26.25 (35)	288	18	43.8	12.6 (70)	30	480	20	35.4	17.0 (85)	3.0 (15)
30.10.08	450	30	46.7	21.0 (70)	9.0 (30)	384	32	76.7	29.4 (92)	8	576	18	28.1	16.2 (90)	1.8 (10)
31.10.08	515	40	50.5	26.0 (65)	14.0 (35)	480	20	41.7	20.0 (100)	-	415	15	34.3	14.3 (95)	0.75 (5)
1.11.08	280	2	0.14	0.04 (2)	1.96 (98)	336	1	1.4	0.6 (55)	45	310	2	6.1	1.9 (94)	0.11 (6)
Average	1635	147	45.4	95.79 (50.5)	51.21 (49.5)	1488	71	38.8	62.6 (79.3)	8.4 (20.7)	1781	55	28.1	49.4 (91)	5.6 (9)

Species composition

Details of species composition recorded at Chennai, Puducherry and Cuddalore are given in Table 2.

Table 2. Species composition of crabs (by weight) at Chennai, Puducherry and Cuddalore

Species	Chennai		Puducherry		Cuddalore	
	Catch (t)	%	Catch (t)	%	Catch (t)	%
Portunus sanguinolentus	42.5	42.5	39.0	55.0	63.7	70.0
P. argentatus	3.0	3.0	8.5	12.0	-	-
P. gladiator	5.3	5.3	-	-	-	-
Charybdis natator	7.8	7.8	7.1	10.0	7.3	7.3
C. lucifera	10.4	10.4	1.4	2.0	1.8	1.8
C. variegata	9.8	9.8	9.2	13.0	14.0	14.0
C. smithii	4.3	4.3	5.8	8.0	13.2	13.2
C. feriata	6.7	6.7	-	-	-	-
Thalamita crenata	2.8	2.8	-	-	-	-
Galene bispinosa	7.4	7.4	-	-	-	-

Totally 10 species (9 portunid and 1 xanthid) were represented at Chennai, of which, *P. sanguinolentus* dominated (42.5 %), followed by *C. lucifera* (10.4 %), *C. variegata* (9.8 %), *C. natator* (7.8 %), *G. bispinosa* (7.4 %), *C. feriata* (6.7 %), *P. gladiator* (5.3 %), *C. smithii* (4.3 %), *P. argentatus* (3.0 %) and *T. crenata* (2.8 %). At Puducherry, only 6 portunid crabs (*P. sanguinolentus* 55 %, *C. variegata* 13 %, *P. argentatus* 12 %, *C. natator* 10 %, *C. smithii* 8 % and *C. lucifera* 2 %) were caught, while at Cuddalore only 5 portunid crabs (*P. sanguinolentus* 63.7 %, *C. variegata* 14 %, *C. smithii* 13.2 %, *C. natator* 7.3 % and *C. lucifera* 1.8 %) were represented.

The pooled data from three centres on the size of the population of *P. sanguinolentus* exploited indicated that for males, the size (carapace width in mm) ranged between 96-145 mm with dominant size group at 106-110 mm and for females, the size ranged from 76 to 150 mm with the dominant size group at 116-120 mm. Females were predominant in the catches constituting nearly 73%. The ovigerous females were in the size range of 121-175 mm and their percentage was 13%.

This is the first observation on heavy landings of crabs during the north-east monsoon period along the northern Tamil Nadu and Puducherry coasts. At Chennai, the estimated crab landing during 3 days (29th to 31st) in October 2008 was 95.75 t, recording three-fold increase when compared to 31 t of crabs landed during October 2007. The usual constituent portunid crab species, namely, *Portunus pelagicus* was completely absent in the trawl catches landed at all the three centres.

Heavy landing of juveniles of lizardfish *Saurida undosquamis* (Richardson) at Visakhapatnam

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Andhra Pradesh has a coastline of 974 km and continental shelf area of 33,227 km. The annual marine fish landings of the state ranged from 2,08,305 to 2, 33,900 t during 2006 to 2009 with an annual average landing of 2, 22,928 t. Highest catch of 2,33,900 t was observed in 2009 and lowest of 2,08,305 t in the year 2007. Among the demersal resources, lizardfish is one of the dominant group. Lizardfish is sold and consumed in both fresh and dried condition at Visakhapatnam and is preferred by poor people as a protein supplement and also used in value added products. Lizardfish is locally called 'Bademattа' and it supports a regular fishery. They are landed by both trawl nets and monofilamentous gillnets. Cod end mesh size of trawl net used to catch lizardfish is 15-20 mm. The annual average trawl catch of lizardfish of Andhra Pradesh during 2006-2009 was 2261 t with a range of 1,718-2,851 t contributing 1.1% of the total catch.

The annual catch of lizardfish in 2009 by monofilamentous gillnet was 194 t and by trawl 1,002 t contributing 1.9 % to total trawl by-catch at Visakhapatnam. *Saurida undosquamis* was the dominant species (43.1%) along with *Saurida tumbil* (33.3%), *Saurida micropectoralis* (13.2%), *Saurida longimanus* (6.1%) and *Trachinocephalus myops* (4.3%). On 29th July, 2010 there was an unusually heavy landing of juveniles of *Saurida undosquamis* by both multiday and single day trawlers (Fig. 1). Trawlers at Visakhapatnam Fishing Harbour landed 4,110 kg of lizardfish, each individual boat landing about 5 to 470 kg. Ninety percent of the lizardfish were *Saurida undosquamis* juveniles. With a catch of 3,699 kg, the total number of *Saurida undosquamis* landed that day was 1, 05,085 and 30 boats were operated and these were caught at a depth of 12-50 m. The size range of juveniles landed was 105 -190 mm and weight range 14 to 57 g. With 170-179 mm being the modal class, the mean size was 170 mm. Most of the fishes were females of stages I and II. The total landings of *Saurida undosquamis* juveniles at Visakhapatnam during 2006-2009 was in the range of 59-71% with mean being 65%.The length at first maturity of *S. undosquamis* is 240 mm (Rajkumar *et al*., 2003).The analysis of the stomach contents revealed that 72% was semidigested fish, 23% was semidigested prawns and 5% was squid. Landing of juveniles on large scale is an unusual phenomenon and so far there were no landings of *Saurida undosquamis* in such magnitude at this fishing harbour. Commercial price of *Saurida undosquamis*

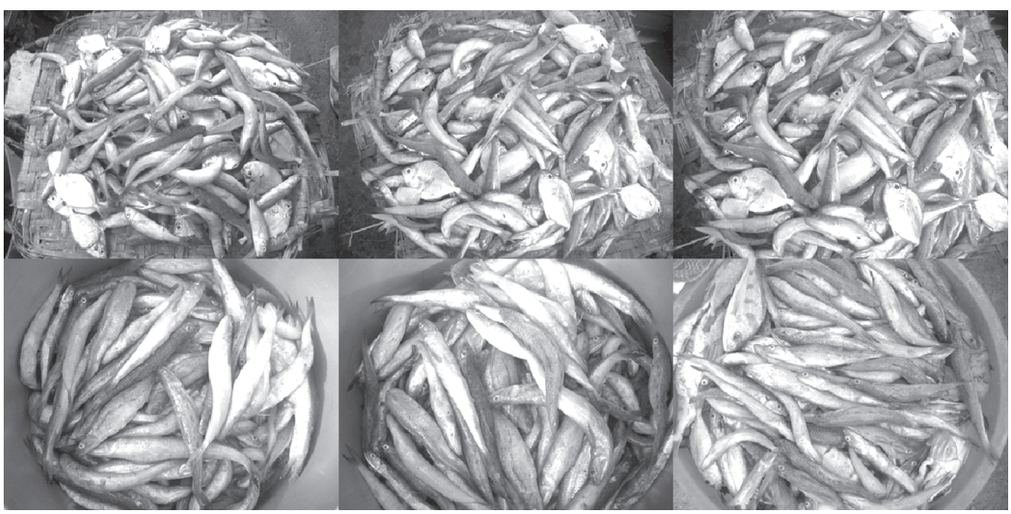

Fig. 1. Heavy landing of juvenile *Saurida undosquamis* at Visakhapatnam Fishing Harbour

juveniles ranged from Rs. 30 to 40 per kg. Landing of lizardfish juveniles to the tune of 90% of the total lizardfish catch in a day is a threat to the fishery and management measures such as regulation of cod end mesh size of trawl net may be suggested to avoid harvesting of immature fish.

Heavy landings of yellowfin tuna *Thunnus albacares* (Bonnaterre, 1788) by hooks and line off Chennai coast

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Tunas are commercially important fish and widely but sparsely distributed throughout the oceans of the world, generally in tropical and temperate waters. They are grouped taxonomically in the family Scombridae, which includes about 50 species. The most important of these in commercial and recreational fisheries are yellowfin (*Thunnus albacares*) (Fig. 1), skipjack (*Katsuwonus pelamis*), bluefin tuna (*T. tonggol*), frigate tuna (*Auxis thazard*) mackerel tuna (*Euthynnus affinis*) and striped bonito (*T. orientalis*). They are exploited mainly by hooks and line, mechanised gillnets and trawlnets in India.

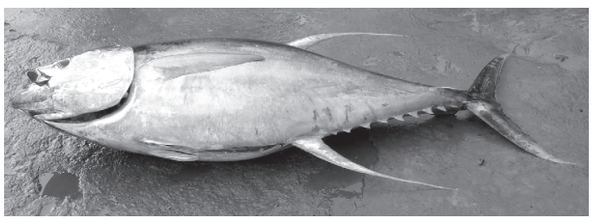

Fig. 1. *Thunnus albacares*

They school primarily by size, either in monospecific or multi-species groups. Larger fish frequently school with whales, feed on fishes, crustaceans and squids. It is sensitive to low concentrations of oxygen and therefore it is not usually caught below 250 m in the tropics. Peak spawning occurs during the summer.

During January - March 2009, heavy landings of yellowfin tuna was observed at Chennai Fisheries Harbour and the catches were 15.0 t, 56.0 t and 73.5 t respectively. Maximum catch recorded on a single day was 5.5 t on 03.03.2009. Hooks and line were operated at a depth of 80-120 m in the north-east direction off Chennai. Yellowfin tuna formed 80-90% of the total catch whereas other catches included sailfish, carangids, seerfish and groupers. The tuna catch was auctioned at the rate of Rs. 80 per kg. Fishes were cleaned, gill rakers removed and degutted (Fig. 2). The cleaned fish were transported to Kerala for high value export market .

Fig. 2. Gillrakers and stomach being removed from yellowfin tuna

Hooks and line fishery of cuttle fish from the artificial trap at Blangad, Thrissur

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Central Marine Fisheries Research Institute, Kochi

About 300 fibre boats fitted with outboard engine are coming to Blangad Landing Centre from Tamil Nadu (Kollamgodu, Neerodi, Enayam, Thoothur and Muttam) for *Sepia* fishing during October - March

period. The type of gear used is hooks and line. At the end of a thread, four hooks (no.10) are attached and above the hooks, some weight wrapped with glittering silvery ribbon attached to attract the animal.

Traps are prepared to attract the cuttle fish. Thirty numbers of coconut spadix are tied together with a plastic rope (Fig.1). This unit is attached to sacks fitted with sand as weight to keep the spadix stand erect. This type of bundle units is placed at the bottom of the sea about 30 to 50 fathom depth. Each boat places 25 numbers of this type of artificial units at different parts of sea. GPS readings are also taken for the units. After 5 to 7 days, fishing is started using above mentioned type of hooks and line, from the artificial structure. It is during this period that the species is coming in large numbers towards the structure for laying eggs.

Fig. 1. Coconut spadix used as a substratum for the attachment of cuttlefish eggs

At this time, fishing starts using the above mentioned gear while the animal tries to bite glittering ribbon. The ribbon and then the thread in which the hooks are fitted, is dragged and the animal is trapped in the hook. Some of the boats earn about Rs.10,000- to rupees one lakh. The weight of each specimen ranged from 500 g to 2.5 kg. Price per kg is in range of Rs. 175 - 200/-.

Once the availability of *sepia* is reduced, new structures are erected at different locations. The cost of each coconut spadix ranges from Rs. 2.50 - 3.50. When enough coconut spadix are not available in Kerala, they are purchased from Tamil Nadu and brought in lorries. Most of the sructures deposited in the sea, are being destroyed accidentally by trawlers.

Fishing of this type is resisted in areas like Kara and Kathiyalam in Thrissur District. Some boats which conducted this type of fishing, have been burnt at Koottai in Malapuram District. It is said that the availabiliy of these species in trawlers, is badly affected or reduced due to this kind of exploitation.

Bumper catch of green mussel in Chettikulam, Calicut

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Malabar coast is the known hub of quality green mussel *Perna viridis,* L. Total bivalve landed along Kozhikode - Kannur coast during 2006 was estimated to 15682 t in which nearly 65% was contributed by the *Perna viridis*. (Laxmilatha *et al*., 2007). Along the coast between Kozhikode and Chombala nearly 283 fulltime and 218 part time mussel pickers are engaged actively in exploiting mussels from the natural beds.

On 10th and 11th October 2010 a large number of villagers living near the coast in the age group of 5 to 65 years mostly women participated in the mussel picking on the rocky beaches of Chettikulam, near 10 km north of Kozhikode (Fig. 1). The sea receded miles away from the beach keeping exposed the laterite rocks for hours together in the evenings. The lowest low tide level on 10th October 2010 at 18.41 hrs was only 0.09 m. The quantity exploited on these days alone touched 600 kg and the size ranged from 50 to 80 mm.

Fig.1 a and b. Mussel beds along the rocky beaches of Chettikulam, Calicut.

Observations on a deformed specimen of *Heniochus acuminatus* (Family Chaetodontidae) from Gulf of Mannar

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An abnormal specimen of the bannerfish, *Heniochus acuminatus* was observed from Pamban Therkuvady Fish Landing Centre during the last week of November, 2009.

It is understood that it was caught from the coral reef areas of Gulf of Mannar by trawlnet operated at around 40 m depth. Normally, in *Heniochus acuminatus*, only the fourth dorsal spine and attached membrane is greatly prolonged into a pennant-shaped appendage. But in this specimen, in addition to this, one more elongated spine with attached membrane is noticed adjacent to the former. The present specimen has a total length of 19.5 cm, and weighs 200 g. The length of elongated fourth and fifth spines are 26 cm and 9.6 cm respectively.

Abnormal specimen of *Heniochus acuminatus*

Rare occurrence of ornate eagle ray at Cochin Fisheries Harbour

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A rare ray, *Aetomylaeus vespertilio*, the ornate eagle ray or reticulate eagle ray was landed at Cochin Fisheries Harbour on 25th January 2011 by a gillnetter operating both drift gillnet and hooks and line (Fig. 1 a and b). The ray was caught by drift gillnet operating at a depth of 200 m. The width of

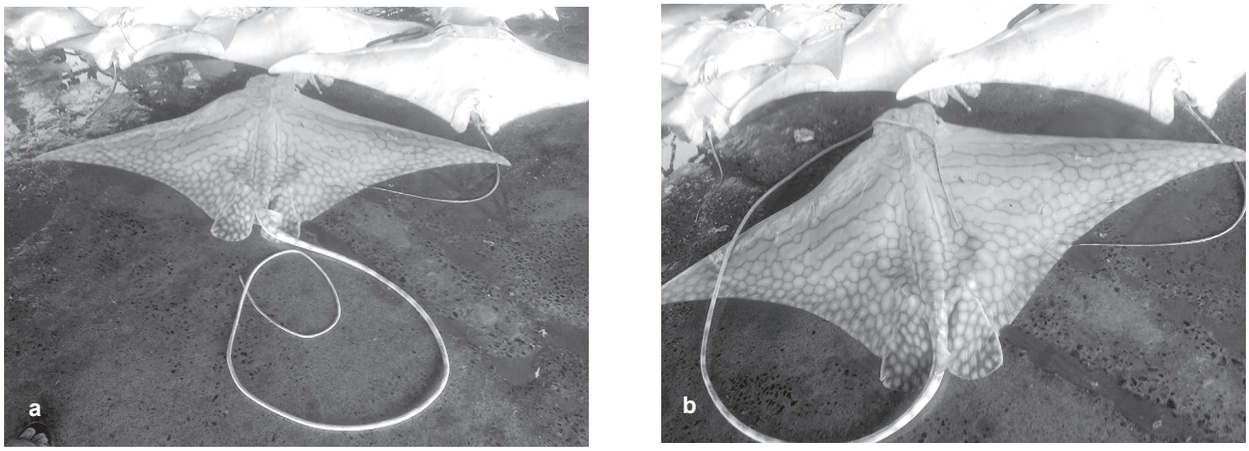

Fig.1a and b. *Aetomylaeus vespertilio* landed at Cochin Fisheries Harbour

the disc was 190 cm and the total length including the tail was 4 m with the tail exceptionally long, over six times the length of the body. The approximate weight of the ray was 110 kg. This ray is included in the IUCN Red List as endangered species.

Landing of a pregnant female tiger shark, *Galeocerdo cuvier* at Cochin Fisheries Harbour

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A female tiger shark of 4 m length weighing approximately 2.5 t was caught in a drift gillnet accidently and was landed at Cochin Fisheries Harbour (Fig. 1) on 25th January 2011. The tiger shark had a belly full of advanced embryos. While it was being loaded into the insulated vehicle, the body sagged to one side. Later due to the difficulty in loading its body into the truck, the belly was cut open. From the placenta, thirty advanced embryos of 70-75 cm in length were taken out (Fig. 2 and 3). Then the whole body, the liver and the advanced embryos were carried off for sale.

Fig. 1. *Galeocerdo cuvier* landed at CFH

Fig. 2. Young one of *G. cuvier* being taken out of the pregnant female tiger shark

Fig. 3. Young ones of *G. cuvier* taken out of the belly of pregnant female tiger shark

First record of albinism in the blacktip reef shark *Carcharhinus melanopterus* from Malabar coast

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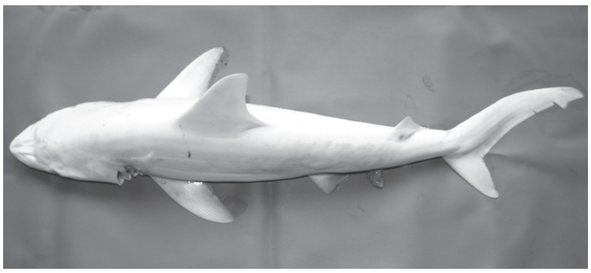
Albinism is lack of pigmentation caused by an enzyme deficiency involving the metabolism of melanin during prenatal development. Among teleost fishes, albino individuals have been reported in numerous species, but in elasmobranchs it is rare. A white coloured balcktip reef shark identified as *Carcharhinus melanopterus* was caught in October, 2010 by a gillnet unit operating off Calicut at a depth of 40 m. The specimen measured 82 cm in total length and weighed 3.2 kg. Morphometric and meristic characteristics were collected and compared with those of normal specimens of the same sex and equivalent length. There were no morphometric differences between the normal specimen and albino shark except its lack of body pigmentation.



Albino blacktip reef shark *Carcharhinus melanopterus* caught along the Malabar coast

Spinner dolphin *Stenella longiostris* washed ashore at Blangad, Thrissur District

K. G. Baby
Central Marine Fisheries Research Institute, Kochi

On 29th July 2010, at a female dolphin *Stenella logirostris* was washed ashore near Blangad Landing Centre in Thrissur District. The animal was in decayed condition and had an injury near throat. The body measurements recorded were:

Total length (snout to notch of caudal flakes)	:	248 cm
Length of upper jaw	:	38 cm
Length of lower jaw	:	38 cm
Total number of teeth on each side		
Upper jaw	:	44 + 44
Lower jaw	:	45 to 47
Approximate weight	:	200 kg.

Spinner dolphin landed at Blangad


Marine Fisheries Information Service